DOCUMENT RESUME

ED 080 495 SP 006 777

TITLE	Project to Design New Patterns for Training R & D Personnel in Education (RFP 70-12). Final Report.
INSTITUTION	Pittsburgh Univ., Pa. Learning Research and Development Center.
SPONS AGENCY	National Center for Educational Research and Development (DHEW/OE), Washington, D.C. Div. of Higher Education Research.
BUREAU NO	BR-0-9043
PUB DATE	Dec 70
CONTRACT	OEC-10-70-4771 (520)
NOTE	400p.
EDRS PRICE	MF-$0.65 HC-$13.16
DESCRIPTORS	*Consortia; *Laboratory Training; *Professional Training; Program Development; *Programs; *Research and Development Centers

ABSTRACT

This is the final report on the project to design new patterns for training research and development (R&D) personnel in education; the project was conducted by a consortium of educational agencies coordinated throught the Learning Research and Development Center, University of Pittsburgh. The report is bound in eight sections: goals and activities of the design project, designs of the training programs, rationale and description of the consortium, scope of work, budgets, list of tasks in educational R&D, behavioral analysis of the curriculum development process, instructional strategy to guide the development of R&D curriculum, and examples of training programs for R&D personnel. (Author)

SP 006 797 - [redacted]

SP

FILMED FROM BEST AVAILABLE CO

FINAL REPORT ON PROJECT TO DESIGN NEW PATTERNS FOR TRAINING R & D PERSONNEL IN EDUCATION (RFP 70-12)

Learning Research and Development Center
University of Pittsburgh

December 18, 1970

LEARNING RESEARCH AND DEVELOPMENT CENTER
UNIVERSITY OF PITTSBURGH • PITTSBURGH • PENNSYLVANIA 15213
DIRECTOR: 208 M. I. BUILDING
LABORATORIES: M. I. BUILDING PHONE 621-3500
ADMINISTRATION: 160 NORTH CRAIG STREET

December 18, 1970

FINAL REPORT ON PROJECT TO DESIGN NEW PATTERNS FOR TRAINING R & D PERSONNEL IN EDUCATION (RFP 70-12)

Project Number: 0-9043

Contract Number: OEC-10-70-4771 (520)

Period Covered: June 19 - December 18, 1970

Submitted to: Mr. John C. Egermeier, Acting Chief, Research Training Branch, NCERD, U.S. Office of Education

Submitted by: Learning Research and Development Center, University of Pittsburgh

Project Director: Dr. Glen Heathers

LETTER OF TRANSMITTAL

Herewith is transmitted the final report of the project identified above, conducted by a consortium of educational agencies coordinated through the Learning Research and Development Center. The report is bound in eight (8) sections, as follows:

Part I: Goals and Activities of the Design Project
Part IIA: Designs of the Training Programs
Part IIB: Rationale and Description of the Consortium
Part IIC: Scope of Work
Part IID: Budgets, with signed authorization
Appendix A: List of Tasks in Educational R & D
Appendix B: A Behavioral Analysis of the Curriculum Development Process; An Instructional Strategy to Guide the Development of an Educational R & D Curriculum
Appendix C: Examples of Approaches to the Development of Components of Training Programs for Educational R & D Personnel

William W. Cooley, Co-Director
Learning Research and Development Center

ED 080495

FINAL REPORT ON PROJECT TO DESIGN NEW PATTERNS FOR TRAINING R & D PERSONNEL IN EDUCATION (RFP 70-12)

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

PART I

GOALS AND ACTIVITIES OF THE DESIGN PROJECT

Learning Research and Development Center

University of Pittsburgh

December 18, 1970

SP 006 777

CONTENTS

Page

1 PROJECT GOALS

1 General Design Criteria

2 Logical Framework of the Training Programs

4 Products Intended

5 PROJECT ACTIVITIES

5 Work Plan for the Design Phase

5 Design Project Staff

6 Job and Task Analyses

6 Survey of Current Training Programs and Materials

7 Specification of Training Strategies

8 Developing a General Model for the Training Programs

13 Selecting the Training Programs to be Conducted in the Operational Phase

15 Designing the Training Programs to be Initiated During 1971-72

17 Developing a Plan for Locating and Building Training Materials

18 Planning to Develop, Implement, and Assess the Training Programs

20 Definitions of Development, Diffusion, Utilization, Evaluation, and Research (DDU/ER)

PROJECT GOALS

This project has the purpose of designing new approaches to training personnel in the development, diffusion, and utilization of instructional innovations. The training programs will emphasize preparation to make substantial contributions to the development and utilization of individualized instruction at preschool, elementary, and secondary levels.

General Design Criteria. The programs are designed to satisfy a set of inter-related criteria as set forth in the list that follows.

1. All training programs will have the purpose of preparing trainees to make impact toward improving instruction in schools.

2. The programs will place their major emphasis on training for developing, diffusing, and utilizing innovations. Training for evaluation and research will focus on prepairing trainees to use these skills in fostering development, diffusion, and utilization. This relationship is represented in the acronym DDU/ER.

3. The contents of training programs, and the contexts within which trainees study, will give systematic attention to "critical" problems of American education: education of minority groups, stress on reading, etc.

4. The programs are designed on the assumption that no R & D activities should be engaged in without taking cognizance of the full set of factors involved in an instructional system. These concern designated learning goals and means whereby individual students are guided toward achieving specified learning objectives. Components of an instructional system include curriculum, tests, instructional organization, learning materials and equipment, staff, teaching methods, and school/community interactions.

5. In designing the training programs, the same procedures have been used that trainees will learn to use in planning and conducting their R & D activities.

6. The programs are not restricted to preparation for today's roles in educational R & D; the combination of skills taught a trainee will prepare him for new roles as well.

7. All trainees will receive an introduction to schools, school instructional programs, and school/community relationships.

8. Trainees will be taught to communicate and interact with other R & D personnel, both across functions and across levels of specialization within functions.

9. Trainees who perform functions involving working with school people will received systematic training for effective communication and interaction with them.

10. Trainees will be prepared to employ their competencies with a broad range of tasks and in a variety of contexts.

11. Trainees will receive an introduction to the range of activities involved in educational DDU/ER. The areas and depth of this introduction will vary with the level of training offered.

12. All trainees will receive training in self-directed problem solving and in self evaluation.

13. An inter-disciplinary emphasis will be provided for through drawing trainees from different academic and work backgrounds and through providing for the interaction of trainees with persons having different backgrounds. Supporting this purpose will be provisions for utilizing experts from various disciplines and occupations.

14. Training programs and program elements will be built so that they can be employed in various training contexts.

15. Through building a consortium representing a broad range of DDU/ER activities and settings, provisions will be made for offering training involving almost any sort of development, diffusion, or utilization activity or context.

16. In order to ensure that trainees can use their training effectively, all programs will stress internship experiences in educational R & D agencies.

17. To ensure that the training needs of individuals having different backgrounds and different purposes are met, trainees will be offered a variety of programs, long- or short-term, degree or non-degree.

Logical Framework of the Training Programs. In the design of the training programs, a number of theory-oriented reference themes shape objectives and training strategies. These are indicated below.

1. The training programs focus on establishing highly generalizable problem-solving competencies. This is particularly important in training for responsible roles in educational development, diffusion, and utilization. To a lesser extent it is true at the technician or para-professional levels where, for example, trouble shooting skills are called for.

2. The programs are designed explicitly to build the competencies, knowledge, and qualities required for designated types of positions.

3. The programs will establish a conceptual grasp of the positions one is being trained for through study of the development/diffusion/utilization/evaluation/research processes and through study of the ways in which functions of different DDU/ER positions interrelate.

4. The programs will train for transfer through calling upon trainees to employ the competencies they acquire in a variety of DDU/ER settings.

5. The programs will provide for an intimate linkage of theory and practice. This calls for following the rule that one learns by doing and thinking about what he is doing. In the training programs, this aim will be fostered especially through the fusion of course work laboratory simulation, and internships.

6. The programs will provide explicit training for participation in group problem solving since most work in educational DDU/ER agencies is performed by task forces rather than by individuals working singly. The programs thus should offer training in group planning, in performing designated tasks in group settings, and in evaluation of group products and processes Training in communication skills and interpersonal relations is relevant here.

7. Individualized instruction will be used in conducting the training programs. This calls for meeting the following requirements:

    a. For each roles, specify training objectives in terms of student behaviors

    b. Set performance standards for an acceptable level of mastery of objectives.

    c. Placement-test each trainee to determine training objectives he has mastered prior to entering the program and those he has yet to master.

    d. Diagnose the trainee's characteristics as a learner.

    e. Employing placement-test and diagnostic information, plan with the trainee his individual training program.

    f. Pre-test the trainee to determine the extent to which he already has achieved the objectives of a unit of training he is about to undertake.

    g. Plan with the student the specific "lesson plan" he will follow in achieving those training-unit objectives he did not satisfy in the pre-test.

    h. Provide the trainee with learning materials, equipment, and settings appropriate to his plan for studying the unit of work.

    i. Provide the trainee help as needed either on an individual tutorial basis or with other trainees, as appropriate.

    j. Continually gather data on the trainee's progress and problems, using the data either to confirm or modify his lesson plan.

k. Post-test the trainee on the unit of work to determine whether he has met performance standards; if not, re-cycle trainee to further work on the unit.

l. Continually revise materials and procedures of the training program on the basis of feedback information.

Products Intended. Five sorts of products are planned for in the design of training programs. These products will result from the operational test of the programs.

1. The training programs, when conducted during the operational phase, will provide a substantial number of trained educational DDU/ER personnel. Program graduates will be persons with specialized training in instructional systems design, curriculum development, developing learning environments, field testing innovations, designing and conducting local change programs, managing innovative projects or programs, and numerous other areas of special competence. Degree and certificate programs will produce graduates for various professional and technician or paraprofessional roles.

2. Following the operational phase, tested training programs will be available for dissemination to other training agencies or consortia of such agencies. The complete programs will include recruitment and selection procedures, instructional units, materials and procedures for assessing trainees' characteristics and progress in training, guides for conducting instruction in the program, guides for establishing and supervising internships, and procedures for placing program graduates. Also, data will be made available to help potential adopters evaluate the programs and to aid them in installing them.

3. A tested model for a consortium of training agencies will be one valuable product of the operational phase. Members of the consortium, following the design phase, will experience three-and-one-half years of intimate cooperation during the operational test. The development of effective patterns of communication, decision making, and productive work involving all consortium members will be a major objective of the operational phase. Formative evaluation procedures will be used continuously to refine and strengthen the consortium model. By the end of the operational test, the consortium model should be sufficiently developed and tested that it could be adopted by other groups of agencies.

4. The operational phase will provide tested approaches to evaluating programs to train educational DDU/ER personnel. One basis for assessment will be to determine how well a program is designed to match training requirements based on job and task analysis. Another will be to assess the effectiveness of program implementation. Another basis will be to determine program effectiveness in terms of trainees' progress. Each of these will be employed during the operational test.

5. One outcome of the operational test will be contributions to theory and research on the selection, training, and utilization of DDU/ER personnel in education. The training programs are designed on the basis of theory and, when available, research findings on training. In designing the programs, there are many decision points such as whether to emphasize course work, laboratory simulation, or internship experiences in establishing a designated competency. Provisions are being built into the designs to test such alternatives through varying training approaches and using appropriate evaluation procedures.

PROJECT ACTIVITIES

Work Plan for the Design Phase. The work of the design phase divided into two closely related areas of activity; designing the new training programs, and planning an operational test to be conducted by a consortium of agencies.

Designing the training programs began with job and task analyses of educational R & D. These analyses resulted in a comprehensive list of R & D tasks. Then followed decisions concerning what training programs would be conducted and what training strategies would be employed. A parallel line of activity was a survey of existing training programs and training materials for R & D in education. Planning the selected training programs followed. It involved specifying learning objectives, outlining course work and laboratory exercises, identifying internship settings and activities, and making provisions for conducting each trainee's program on an individualized basis.

Throughout the design phase, members of the consortium contributed to job and task analysis, to the choice of training programs, and to specifying sources of trainees and settings for internships. Planning the operational test of the training programs has involved the active participation of all members of the consortium.

Design Project Staff. Full-time members of the design staff have been Glen Heathers, Project Director; Todd Simonds and Dorothy Zorn, Research Assistants; and Susan Tutko followed by Debra Faust, Project Secretary. Four members of the staff of the Learning Research and Development Center who were major part-time contributors to the project have been John Bolvin, William Cooley, Lauren Resnick and John Yeager. Key inputs also have been made by the following members of the LRDC staff: C.M. Lindvall, Anthony Nitko, and Warren Shepler. Michael Gladis of the Department of Educational Psychology of the University of Pittsburgh has contributed to planning course work in Instructional Psychology that will be available to students in the new training programs.

Major portions of the work of the design project have been contributed by George Gropper of the American Institutes for Research, and by John Folley and Kenneth Rifkin of Applied Science Associates under joint agreements entered into with their institutions.

Job and Task Analyses. Initially, conducting a nation-wide questionnaire survey of R & D jobs and tasks was considered. The notion was abandoned as not feasible within the time and funds of the design project. Also, such a survey would have duplicated much of the work of the survey project being conducted concurrently by Teaching Research at Monmouth, Oregon. The analyses conducted depended on a literature search, consultation with experts in educational R & D, and detailed examination of jobs and tasks represented within agencies of the project consortium, notably the Learning Research and Development Center, Research for Better Schools in Philadelphia, the Pennsylvania State Department of Education, the Philadelphia and Pittsburgh public school systems, and the office of the Allegheny County, Pennsylvania public schools. Task lists prepared by the Teaching Research project and by the AERA Task Force on Training Research and Research-Related Personnel also were helpful.

An interview study of tasks performed by research assistants at LRDC (conducted by Dorothy Zorn and Todd Simonds) contributed valuable data on tasks such personnel perform in the area of development, while a parallel investigation of tasks performed by personnel at Research for Better Schools contributed to the preparation of the task list for diffusion. Task lists provided by representatives of school systems within the project consortium were particularly helpful in developing the task list for utilization, that is, the design and conduct of local change programs.

Three chief products have resulted directly from the job and task analyses. A first is a set of working definitions of development, diffusion, utilization, evaluation, and research. These are attached as the concluding pages of this section.

The second product is a comprehensive and systematic List of Tasks in Educational R & D that appear as Appendix A of this report. The list is divided into eight areas of tasks or competencies: development, diffusion, utilization, evaluation, research, R & D foundations, personal/social competencies, and project management.

The third product is A Behavioral Analysis of the Curriculum Development Process by George Gropper and Lauren Resnick. It appears as Part A of Appendix B. This working paper exemplifies an approach to task analysis that provides a specific basis for developing instructional materials for use in the training programs.

Survey of Current Training Programs and Materials. The individualized training programs will require an extensive bank of instructional materials specifically related to thelist of R & D tasks or to learning objectives derived from that list. It will not be feasible, given the limitations of time and money for the operational phase, to develop the full range of materials needed. Fortunately, this will not be necessary since there is a considerable, though diffuse, supply of relevant training materials now available or in process of development throughout the country. The bulk of materials employed in the training programs to be conducted will be drawn from external sources. In many instances, these materials will need to be modified to adapt them to the needs of the training programs to be conducted in this project.

The project staff of the design phase has conducted an extensive search for materials currently available or under development. The list of tasks defined the scope of materials that were sought; no instructional medium was rejected at this stage. The first step in the search was to identify and contact persons who had been involved in conducting similar surveys. These included persons associated with the AERA Task Force on Training Research and Research-Related Personnel; the Special Media Institute of Teaching Research at Monmouth, Oregon; the American Institutes for Research; projects under U.S.O.E. RFP 70-27; and the ERIC and ENTELEC information systems. These sources generaged numerous leads.

Next, each developer, producer, or distributor identified by the above sources was contacted with the request for copies of materials and for information about its use and its demonstrated effectiveness. When copies of materials were not available, detailed descriptions were sought specifyiing learning objectives, content, method of instruction, estimated modal training time, etc.

As the materials and descriptions came to hand, each unit was analyzed for content specifically referenced to the list of tasks, and for type and extent of coverage. Information from the analysis was recorded in a cross-reference system, with a data sheet for each unit of material and for each R & D task.

Because neither the solicitation nor the analysis is complete, it is too early to report specific, substantive findings. Four general observations summarize the work to this point:

1. Considerable materials are available involving tasks in the development and evaluation work flows.
2. A number of promising simulation packages relating to critical diffusion/utilization tasks are in the final stages of development.
3. Few instructional packaged analyzed to this point are independently adequate; rather, training units usually have to be built by adapting or supplementing materials produced externally.
4. No materials that have come to hand offer the extensive practice opportunities essential to the training programs that are being developed in this project.

Specification of Training Strategies. Decisions about training strategies have been made by training experts within the project consortium, particularly staff members of LRDC, the American Institutes for Research, and Applied Science Associates. Two key contributions concerning training strategies were provided by Lauren Resnick of LRDC and George Gropper of AIR. The Resnick contribution was offered in connection with her proposal on teaching trainees to prepare instructional materials. She proposed, as types of instructional strategies, the use of stimulus fading, diagrams and other visuals as cues, verbal prompting, simulation, modeling, spacing of practice, both recognition and constructed responses, both brief and extended constructed responses, backward chaining, different forms of feedback, and role playing. She proposed a four-component instructional program in the preparation of lesson materials, as follows: (a) seminar on the theory of instructional or lesson design; (b) seminar on the analysis of instructional materials; (c) laboratory in the editing of instructional materials; and (d) laboratory in preparing instructional materials. An internship could run concurrently with the above or follow them.

The Gropper proposal is presented as Part B of Appendix B. In summary, the chief points in the strategy he recommends are these:

1. The same types of stimuli and responses that are involved in actual performance of a task should be used during practice of the procedural, problem-solving training tasks.

2. Simulation of non-symbolic stimuli should be used as a way to avoid unsupportable costs. Printed case studies should be used for this. Later, trainees should deal with terminal type stimuli.

3. Programed materials, requiring active practice, would be ideal for knowledge components. However, it is unlikely that programed materials can be prepared in time for the start of training so seminars would be used.

4. Paper and pencil exercises can be used to provide the practice that can build to terminal performance. Wherever possible, practice exercises will rely on demonstration followed by terminal performance.

5. The curricula of the training programs should exploit a broad range of intrinsic and extrinsic reinforcers: stipends, grades, degrees; acquisition of professional skills, share in authorship, relevance of problems to the trainee's experience, etc.

6. A core program for each task area should be offered all trainees to facilitate communication within and across functions.

7. Backward chaining of related training units should be employed when possible. Required trainee responses should progress from recognition of terminal performance to editing of terminal performance and finally to production of such performance.

Developing a General Model for the Training Programs. The basic training model needs to be consistent with the design criteria and with the logical framework presented at the beginning of this part of the report under Project Goals. The model needs to provide for training that results in knowledge and skills that are generalizable to a variety of R & D contexts; for a broadly-based introduction to educational R & D in terms of critical educational problems and in terms of the processes of development, diffusion and utilization of innovations offering solutions to those problems; for training that takes account of the fact that educational R & D is performed mainly by problem-solving teams rather than by individuals working singly; and for training to do rather than merely to talk or write about R & D tasks. Further, the design criteria call for individualized training programs and for an emphasis on trainee self-direction.

The general model for designing training programs that is being employed calls for three types of learning context: course work studied through reading, seminars, or media presentations; laboratory exercises or projects; and internship experiences. With most R & D tasks in the training programs, learning in all three of these types of contexts will be provided.

The tasks covered in a training program, and the level to which any of these is mastered, depends on the area of specialization and the level of training. Areas of specialization for which training will be offered are development (curriculum, training programs, or instructional environment), diffusion (field testing, demonstration, dissemination), and utilization (local change programs). Four levels of training will be provided for: Project Director (PD), Professional Assistant (PA), Technical Assistant (TA), and Para-Professional (PP). The major differences in the training of Project Directors and Professional Assistants will be in scope (Project Directors will receive more training to interrelate development, diffusion, and utilization) and in management training (Professional Assistants will not receive specific training to manage operations above a sub-project level). Technical Assistants will be trained to perform specific types of highly-structured procedural tasks (such as test-item writing) or to apply such technical specialities as film-script writing or computer programing to educational R & D. Para-Professional will be trained to perform highly specific tasks such as routine data analysis, demonstrating equipment, or preparing audiotapes.

The level of training with respect to a given task follows a formula devised by John Folley of Applied Science Associates. His formula (slightly modified) follows.

CORE LEVEL (C)

Training Emphasis

Conveying to the trainee:

a. A description of the task area
b. Basic concepts and principles
c. Relation of task area to other task areas
d. Kinds of applications of the task area

Usual Characteristic of Unit Objective

Recall of information:

C1-level: Can describe the general content of a given task area and state types of problems in which the area might be relevant.

C2-level: Can accurately state a substantial and significant body of facts, principles, guidelines in the task area, but cannot make any significant application of the knowledge to solution of real problems.

Usual Training Approach

Reading/Seminar/Programed Instruction

ANALYSIS LEVEL (A)

Training Emphasis

Studies examples of task products, analyzing them in detail with reference to variables and interactions of variables specified as critical for performance and evaluation of the task.

Usual Characteristic of Unit Objective

Demonstrates ability to analyze products as specified.

Usual Training Approach

Seminar/Laboratory/Field Observation

PRACTICE LEVEL (P)

P1-level

Training Emphasis

Elementary guided practice. The student works problems in a simplified form in order to learn the fundamental skills and knowledges and their application to basic problems. The problems are simple early in the unit, and become increasingly difficult.

Usual Characteristic of Unit Objective

Demonstrated ability to perform these simplified problems.

Usual Training Approach

Programed Instruction/Laboratory

P2-level

Training Emphasis

Advanced guided practice. The student works problems that present a close approximation to the technical complexity he will have to face in the real world. Excluded, however, are the problems of interaction with other persons, such as school system personnel, the public, etc.

Usual Characteristic of Unit Objective

Can perform the task such that the work would be completed within an economically acceptable expenditure of time, and would be judged sound, valid, and correct on all technical criteria. This level of competence implies that no review of the work would be required by any supervisor, manager, review board, etc. The person with this level of competence in a task can perform the technical aspects of the task independently.

Usual Training Approach

Laboratory problems solved under supervision of a mentor.

THEORY LEVEL (T)

Training Emphasis

Broader application of principles or methods in task area. The student learns to apply underlying theory and generalizable principles in a variety of situations.

Usual Characteristic of Unit Objective

Can properly apply the facts, principles, methods, theory, guidelines, of the task area to the solution of problems such that the work would be judged to be sound, valid, and correct. This implies independent work not requiring supervision or review.

Usual Training Approach

Seminars/Laboratory.

JOB LEVEL (J)

Training Emphasis

Job-like practice. Beginning with simple problems, the student learns to attack and solve them in the real environment of DDU/ER. He is given problems of increasing difficulty, both in the technical sense and in the sense of coping with real-world variables.

Usual Characteristic of Unit Objective

Ability to function satisfactorily in the real world of the professional DDU/ER person.

Usual Training Approach

Internship experiences.

In any area of R & D specialization (Development - Curriculum; Diffusion - Field Testing; Utilization - Local Change Programs; etc.) training will be obtainable for four levels of position: Project Director, Professional Assistant, Technical Assistant, or Para-Professional. The differential requirements of different training programs are identified first by specifying those tasks to be included in a program, then by specifying for each task the level to which it will be mastered. The first six training levels (C1 through T) constitute a general sequence; training in the task can be carried to any of these levels. Work at the J level will vary in advancement. Thus a trainee for Technical Assistant might advance in a task to the P1 level, then perform on the job at a level not requiring P2 or T levels of performance.

In any training program, the tasks the trainee will learn to perform will be those required for competence at his level of training and in his area of specialization. These tasks will concentrate most heavily within the work flow for his area of specialization; however the trainee may need also to learn to perform numerous tasks in other task areas.

Technical Assistants and Para-Professional will be offered short-term training programs focused on a limited set of tasks in the area of specialization. Training in these tasks may be to the P1 level, skip the P2 and T levels, and resume with performance of the task or part of the task in an internship or job situation. Short-term training programs will also be offered Project Directors or Professional Assistants by selecting a part of the work flow in their areas of specialization as the focus of intensive training.

Trainees in short-term programs will receive a general introduction to Educational R & D Foundations, and a core program (at the C1 level) introducing them to the work flows for Development, Diffusion, Utilization, and Evaluation. Also they will receive training in the relevant Personal/Social Competencies.

In all the training programs, there will be an emphasis on learning in group contexts. Group projects will be included in course work and labs, and internships will offer experience in team participation.

Individualization of training will be accomplished by placement testing and pretesting each trainee to determine what knowledge and competencies in his program he possesses already. Then a special program of studies will be planned for him whereby he will gain the knowledge or skills he has yet to acquire. When, and not until, a trainee demonstrates mastery of the tasks assigned him, he will leave those tasks and proceed to the next tasks in his program. Over-all program guidance will be given each trainee by an adviser assigned to him for his entire training period.

Selecting the Training Programs to be Conducted in the Operational Phase. Given the severe limitations of personnel, time, and money that will apply to the operational phase, it will not be possible to design, build, and test more than a few of the numerous training programs that could be offered in the areas of Development, Diffusion, and Utilization. Selecting those programs to be conducted required judging which among the possible programs would make the best use of the resources of the Consortium in making strong, widespread, and early impact on instruction in critical problem areas.

The decision has been made to develop and conduct training programs in two areas of specialization: Development - Curriculum, and Utilization - Local Change Programs. There were several reasons for making this decision. The choice of curriculum development as one program area was made because the most fundamental approach to the solution of critical educational problems is to build curricula whose learning objectives and instructional materials are specifically designed to deal with those critical problems and to reach the appropriate student populations.

Competencies in curriculum development are strongly represented among members of the Consortium. The Learning Research and Development Center conducts several major programs of curriculum development for individualized instruction at preschool and elementary levels for various student populations including children from the inner city. Research for Better Schools does extensive work in curriculum development. The American Institutes for Research and Applied Science Associates both have expertise in curriculum development, particularly for training programs. Other members of the Consortium also engage in curriculum development or in adapting curricula for use in schools.

A point requiring emphasis is that the process of curriculum development necessarily involves tasks from several R & D areas. Implementing a curriculum--a necessary part of its development--calls for modifying the instructional environment and for training teachers to use the curriculum. Test development skills are required in building the achievement sub-tests accompanying curriculum units. Skills in formative and summative evaluation also are needed in building the curriculum and in assessing its outcomes. Research skills are needed at those points where it is necessary to conduct studies providing bases for designing the curriculum. Project management skills are needed in positions involving supervision of co-workers.

The decision to conduct programs in the area of Utilization - Local Change Programs was made to give emphasis to the pay-off of educational innovation--the implementation of innovations in the instructional programs of the schools. The ultimate consumer of innovations is the student. Local change programs provide the instrumentality whereby innovations reach the student.

Most of the agencies in the Consortium are involved in the design, conduct, and evaluation of local change programs. Most directly involved are the four public school systems in the Consortium: Avonworth, Baldwin-Whitehall, Philadelphia, and Pittsburgh. The Pennsylvania State Department of Education and the Allegheny County Public Schools play major roles in relation to local change programs, especially programs under Titles I and III. WQED-TV works extensively with local school systems in change programs involving instructional television. Both LRDC and RBS have many associations with school systems in relation to change programs involving individualized instruction.

Training programs in the area of Utilization require learning to perform many tasks in other R & D areas. The analysis of local needs and resources requires competencies in formative evaluation as does the design and conduct of change programs. Designing change programs involving curriculum modifications requires competencies in the analysis of curricula. Designing ways to implement curricula calls for competencies in staff training and in modifying the instructional environment. When a change program is implemented, most of the skills involved in Diffusion - Field Testing are needed. And, when it is decided to spread a local change program that has been implemented and tested in pilot schools to other schools in the system, skills in Demonstration and Dissemination are needed.

The decision has been made to offer training during the first year of the operational test only for Project Directors and Professional Assistants, leaving for later the conduct of training programs for Technical Assistants and Para-Professionals. The decision to employ training resources at the two upper levels of training reflects the judgment that the most critical training needs are at these levels. Also, surveys made of R & D agencies in education have revealed few positions at the level of technician or para-professional. (Doubtless training programs at the lower levels are needed and should result in more efficient use of the competencies of higher-level personnel through relieving them of the need to perform tasks that less well-trained personnel can perform. Such programs will receive attention during the latter part of the operational phase.)

Another key decision made is to offer both long-term and short-term training programs in each of the two areas of specialization. Short-term programs will be offered beginning in the summer of 1971 and continuing on-the-job during the fall months. Long-term programs will be initiated in September 1971, will be two or three years in length, and will offer the masters or doctoral degree or equivalent certification. The advantage of the short-term programs is that they offer prompt pay-off in key aspects of development or utilization. The advantage of the long-term programs is that they will provide a high level of training suitable for major contributors to educational R & D.

The short-term program in Development will train for building instructional materials. This is a key aspect of curriculum development. Also, it is separable from other aspects and can be taught in a relatively short period of time to a level of effective productivity. In this program, trainees will be taught to build curriculum materials, given a set of objectives for the unit or lesson to be built. The program will build and test units that can be valuable for training the thousands of research assistants engaged in the writing of learning materials in the many curriculum development agencies across the country. Obviously, a short-term program offering a total of six to eight weeks of training cannot do the full job of preparing leadership in the design and conduct of local change programs. This is the task of the long-term program being offered. What is claimed for the short-term program is that it can substantially upgrade the quality of plans for local innovative programs, increasing their relevance to critical educational problems and improving the probability that they will be effective in dealing with such problems.

Designing the Training Programs to be Initiated During 1971-72. Building components of the four training programs is the chief task of the first six months of the operational phase. A function of the design phase is to indicate which components must be built and what requirements they must satisfy. The program designs are presented in Part IIA of this report. The designs employ the training strategies and the general model for training programs presented earlier in this section of the report.

The first step in outlining each of the four training programs was that of specifying the tasks in the List of Tasks in Educational R & D (Appendix A) that will provide the content of the program. Next, the level at which each of these tasks will be mastered was set. With Programs 2 and 4, the levels were set differently for Project Directors and for Professional Assistants. Obviously, both of these sorts of decisions had to be made without a specific data base; expert judgment had to be depended upon in the absence of any other criteria. Many of the judgments made doubtless will prove erroneous when the training programs are developed and tested.

The third design step was to spell out the training approaches that will be employed in the programs. Illustrations of approaches to be used can be found in Appendix C. The first illustration offered there (by Heathers) exhibits how training units can be identified by analyzing the requirements (or aspects) of a task, then matching these requirements with suitable training content. The four tasks in the illustration were drawn from the work flow for curriculum development. The second illustration (by Resnick) specifies a training strategy and applies it to a key task in the work flow for curriculum development--prepare instructional materials. The third illustration (by Gropper) presents training materials on identifying and analyzing terminal objectives of instructional programs. This illustration, developed in another project, employs the method of task analysis and the instructional strategy presented in Appendix B of this report.

With each training program, designating the training approach called for indicating how course work, laboratory units, and internship experiences would be utilized to establish the knowledge and skills required by the program. While course work and labs, generally speaking, will precede the internship in order to provide a foundation of knowledge and skills, real-work experiences will be made to interact with study and labs whenever feasible. Thus seminars and labs will continue during the internship period to supplement, strengthen, and integrate the training received in the internship. Once again, decisions made concerning instructional approaches had to be based on the judgment of consortium members having expertise in instructional systems design, curriculum development, training program development, and uses of instructional media.

Closely related to the training approach is the design of procedures for individualizing the instruction each trainee will receive. The general approach used can be labeled instructional guidance. It begins with trainee recruitment and continues with selection, orientation, individualized program planning, supervision and counseling, progress assessment, certification of training accomplishments, job placement, and follow-up. The heart of the process is continuing contract-type planning by the trainee and his adviser on the basis of regular and systematic learner diagnosis and achievement assessment.

An aspect of program design that has been given little attention thus far is that of estimating training time. One reason for this is that individualized instruction allows that different trainees take very different amounts of time to master a given task. Another reason is that estimating training time can be done much better after training materials and procedures are fairly well developed than before. To a considerable extent, the duration of a trainee's program will be determined by factors other than his entering behaviors and his learning rate. Course work usually has to be set within a fairly rigid time frame, especially if university credit is offered. Students cannot always be made free to advance at whatever rate they can master course requirements. Likewise, internships usually require that the trainee remain in the same job for several months in order that his productive output justifies the time and money spent on him. In designing the programs, special efforts have been made to provide flexibility in program elements, training experiences, and time allocation in order to enhance the individualization of instruction.

Activities of the Project Consortium During the Design Phase. Throughout the design phase, major attention has been paid to the development of a consortium of agencies for work on the design of training programs and for conducting the operational test of the programs. Fifteen agencies were members of the Consortium at the close of the design phase. A list of these agencies, and their representatives on the Consortium, is included in Part IIB of this report. Types of agencies in the Consortium are these:

Research and Development Centers
Regional Educational Laboratories
Universities
State Education Departments
Intermediate Educational Units
Large School Districts
Small School Districts
Private (Profit and Non-Profit) Educational R & D Agencies
The Education Industry
Educational Television

Each of the 15 member agencies has made specific inputs to the design phase. EAch month during the design phase, a half-day meeting has been held of the full Consortium for the purpose of reviewing progress and planning next steps. Seven such meetings were held. Planning with different members of the consortium, singly or in task forces, has been a continual process throughout the entire design phase. All members of the consortium have provided valuable information on R & D jobs and tasks. Most have contributed to the identification of training approaches and materials.

Near the end of the design phase, all members of the consortium responded to a questionnaire asking for specific ways in which they would be prepared to participate during the operational test of the training programs. The results of this inquiry are presented in Part IIB of this report.

The Consortium has been formally organized for the operational phase in terms of a Working Agreement signed by all parties. One proof of the viability of the Consortium is that all 15 agencies signed the agreement and indicated the desire to participate in the operational phase.

Developing a Plan for Locating and Building Training Materials. A major task during the operational phase will be the continued search for usable training materials developed elsewhere. The search for such materials made during the design phase has been referred to earlier (pages 6-7, above). Search, analysis, and reference procedures developed in that quest will be employed during the operational phase. The process of building training units will be facilitated by the cross-reference system developed to record information. For each R & D task or task area, a single reference sheet indicates the extent and kind of coverage provided by the training materials that have been located. Adequate coverage demands theory and procedural presentations, and extensive practice opportunities. These three seldom are found in one unit of training material. The reference chart indicates which training units to select and collate (with adaptive editing) to provide for the needed coverage. During this process, the gaps in available materials will become evident, pointing to further survey or development needs.

Since the survey probably will locate few materials offering extensive laboratory practice opportunities, a complementary search will be conducted to develop a bank of case materials for use in labs. This bank should include such items as lesson specifications generated in curriculum projects, curricular materials with real try-out data, and case data on actual diffusion or local change programs. An excellent source for this kind of raw material is the training consortium itself. The case and project materials that members of the consortium can provide will constitute, when structured for use in labs, a set of practice materials as realistic and representative as can be found.

A third search will be conducted to locate theoretical and descriptive materials for use in seminars that will be offered in the training programs. These materials should represent the major issues, theoretical positions, and innovative activities involved in current efforts toward improving instruction. The compendium of documents on educational R & D being compiled by Teaching Research will be especially valuable in this connection.

The work of building training materials to be conducted by or arranged by the project Compendium and staff will be performed in several ways. One approach will be to sub-contract segments of the materials development task to the American Institutes for Research, Applied Science Associates, or other agencies within and outside the Consortium having expertise in building training materials. It is planned that a major part of the training materials for the core level will be developed through such sub-contracts. As part of their training, trainees in the programs will be called upon to locate or generate training materials and to contribute them to the materials bank. Finally, throughout the operational phase, the project staff will devote a major share of its work to materials development since many needs of the training programs cannot be met in any other way.

In the Scope of Work, specifications on how materials development activities will be conducted during the operational phase are presented.

Planning to Develop, Implement, and Assess the Training Programs. The process of developing the training programs to the point where they can be implemented and assessed has been a major focus of planning activities during the design phase. Linked with this process has been that of planning the instrumentalities for placing the programs in operation, modifying them through formative evaluation, and assessing their outcomes.

While the general specifications for the four training programs have been formulated during the design phase, much work needs yet to be done before the programs will be operable. In addition to developing training materials, details must be worked out on procedures for conducting the programs, on instructional settings and schedules, on personnel to conduct instruction in the programs, and on administrative aspects of the operational phase. These planning and development activities are included in Scope of Work under program development activities.

In preparing to implement the training programs, two areas of activity during the design phase have been central. One has been the detailed planning for the participation of Consortium members during the operational phase. The outcomes of this planning are presented in Part IIB.

The other key area of planning has been building, within the School of Education at the University of Pittsburgh, a new program in Instructional Development that will provide the coordinating agency for the training programs, a chief locus of training, and the medium for offering trainees credits, degrees, and certification. The program will provide a comprehensive and systematically interrelated set of training components covering the variety of tasks involved in the List of Tasks in Educational R & D (Appendix A). The program will be established as inter-departmental, with instructors drawn from Educational and Developmental Psychology, Educational Research, Psychology, Educational Communications, and other university departments. Most of the instructors also will be members of the staff of LRDC. The program will be directed, during the operational phase, by a faculty member of the School of Education who also will be a member of the staff of LRDC and the director of the operational test project.

The work in Instructional Development will be supplemented by coursework offered in various departments of the University of Pittsburgh. This refers especially to courses in psychology, educational and developmental psychology, educational research and evaluation, educational communications, educational administration, and computer sciences. Of particular interest is the establishment, within the Educational and Developmental Psychology Department, of a new doctoral program in Instructional Psychology. This program will provide course work that is highly relevant to the needs of trainees in Instructional Development for psychological theory and research related to instruction.

A general plan for formative and summative evaluation of the training programs has been outlined by C.M. Lindvall of the LRDC staff. Developing this plan in detail, and providing for its implementation, is part of the program development work to be performed during the initial months of the operational phase.

A plan for administering the operational phase, and a general work plan for the three-and-one-half-year project, have been prepared with the assistance of John Yeager and Todd Simonds. The full-time project staff, to be located at LRDC and the School of Education, University of Pittsburgh, will consist of the project director, two senior research associates, two research assistants, and a secretary. In addition, numerous members of the LRDC staff will contribute portions of their time to program development, program assessment, and instruction within the programs. Further, numerous faculty members of the University of Pittsburgh will instruct within the programs. Details concerning project personnel, including Consortium member's contributions to instruction in the programs, will be worked out as part of the program development activities.

A general work schedule for the 42 months of the operational phase is presented in the Introduction to Scope of Work. This schedule is tentative; major revisions may be needed as program development proceeds during the early months of the operational phase, or as experience is gained in implementing and assessing the training programs. Highlights of the work schedule are the focus on program development, materials development, and trainee recruitment between February and June of 1971; on training activities accompanied by further materials development work during the period July 1971-June 1972; on development activities related to two additional training programs--Development: Training Programs, and Development: Instructional Environment Systems--during the first six months of 1972; and on the launching of these two additional programs during the fall of 1972.

DEFINITIONS OF DEVELOPMENT, DIFFUSION, UTILIZATION, EVALUATION, AND RESEARCH (DDU/ER)

DEVELOPMENT refers to any or all parts of the process of engineering a product from the inception of the idea for it to a finished and tested version. By product is meant anything created through a development process, whether it be in the form of material objects, of procedures, or of programs.

Ordinarily development concerns the creation and testing of "prototype models." Where different versions of the product are created, this too is development. Wide-scale production, testing, and distribution of a product falls under diffusion rather than development.

A confusion can result from the fact that one can develop research methods, diffusion procedures or materials, and evaluation procedures and materials. This simply illustrates the fact that the "linear model" does not correspond to reality since rarely does the process research-to-development-to-diffusion-to-evaluation run the course implied by this sequence.

DIFFUSION covers any aspect of the processes of promoting or facilitating the wide-spread utilization of a product that has been developed through the prototype-model stage. Diffusion may be separated into components bearing the labels field testing, demonstration, and dissemination. Two other terms falling under diffusion are production and marketing.

Field Testing involves implementing the product in different types of settings to determine its appropriateness to the needs and resources of the various settings and to work out ways of adapting the product for use in different settings. Field testing often requires major programs to train local personnel to implement the product.

Demonstration involves implementing the product in one or more settings and providing opportunities to observe it in action. A demonstration installation also can be used to provide intern training, if desired.

Dissemination consists of spreading information about a product through any communication channel--talks, written materials, films, video-tapes, visits to demonstration or field-test sites, etc.

Production refers to making multiple copies of the product in finished form, with the purpose of providing enough copies to satisfy the market for the product.

Marketing refers to building in potential users a readiness to adopt the product and to building a distribution network to supply adopters.

UTILIZATION refers to the design and conduct of local change programs that are intended to improve instruction or the conditions under which it is conducted. Utilization is consumer-, rather than product-oriented. It should arise out of recognition of a need for improvement and should involve incorporating in the change program those innovations judged to offer most toward meeting the need (within the resources available).

Adoption refers to utilizing a designated innovation within the local change program.

Adaptation refers to modifying a product to suit the characteristics of the local school system--its student body, its staff, its community, its material resources, etc.

EVALUATION covers any instance where something is measured in its relation to a criterion. Simply measuring something using an appropriate instrument or procedure is not evaluation since this is not determining the extent to which a criterion is satisfied. A common usage is to distinguish formative and summative evaluation.

Formative evaluation is used to assist in the development of a product. Especially useful is evaluating the extent to which the stage of development or implementation of the product satisfies the criteria set in the development plans. Such evaluative evidence is used as "feedback" information to help in modifying the product design or the implementation approach.

Summative evaluation consists of measuring outputs delivered by the product in terms of the criteria set by the intended outputs.

Test Development is a special area of evaluation that covers the design, construction, and assessment of measuring instruments. Such instruments are especially needed in assessing student achievement of curriculum objectives and in diagnosing student input characteristics.

RESEARCH is the systematic study of relationships between or among variables with the purpose of arriving at generalizable knowledge of such relationships. When research studies are theory-based, they test hypotheses. When research confirms an hypothesis it becomes a principle or law or rule.

The distinction between basic and applied research is useful even though it often is hard to determine under which of these labels a given study falls. The emphasis in basic research is on arriving at highly generalizable knowledge about the relationship of variables. The emphasis in applied research is on obtaining knowledge that can be put to use in solving practice problems (the knowledge then provides a basis for engineering a solution).

Sometimes basic research findings are translated directly into applications. Thus research on reinforcement schedules has provided the basis for "contingency management" in classrooms. At other times, basic research theory and findings orient efforts to engineer solutions even though they are not specifically translated into practices. Thus research on the effects of positive and negative reinforcement has provided a basis for "accentuating the positive" and "eliminating the negative," though the ways of doing this have to be worked out with little help from the research findings.

ED 080495

FINAL REPORT ON PROJECT TO DESIGN NEW PATTERNS FOR TRAINING R & D PERSONNEL IN EDUCATION (RFP 70-12)

PART IIA

DESIGNS OF THE TRAINING PROGRAMS

Learning Research and Development Center

University of Pittsburgh

December 18, 1970

SP 006 777

CONTENTS

Page

1 . . . . Introduction

5 . . . . Program 1. Short-Term Program to Train Professional Assistants to Build Curricular Materials

9 . . . . Program 2. Long-Term Program to Train Project Directors and Professional Assistants to Develop Curriculum

25 . . . . Program 3. Short-Term Program to Train Project Directors to Design Local Instructional Change Programs

35 . . . . Program 4. Long-Term Program to Train Project Directors and Professional Assistants to Design and Conduct Local Change Programs

49 . . . . General Plan for Individualizing the Training Programs

50 . . . . General Plan for Implementing the Training Programs

50 . . . . General Plan for Evaluation in the Training Programs

DESIGNS OF THE TRAINING PROGRAMS

Introduction

This section of the report gives a description of the training programs that will be developed, implemented, and assessed during the operational phase. The work of the operational phase, during the first year, will focus on developing and initiating training in two major areas of innovation--curriculum development and the design and conduct of local change programs. During the second year of the operational phase, it is intended to develop and initiate two additional program areas--development of training programs, and development of instructional environment systems. These additional specialities in the general area of development overlap markedly with curriculum development and can be added the second year without involving major additional demands on project resources.

The four programs to be launched during the initial year (February 1, 1971 January 31, 1972) are the following:

Program 1. Short-term Program to Train Professional Assistants to Build Curricular Materials

Program 2. Long-term Program to Train Project Directors and Professional Assistants in Curriculum Development

Program 3. Short-term Program to Train Project Directors to Design Local Change Programs

Program 4. Long-term Program to Train Project Director and Professional Assistants to Design and Conduct Local Change Programs

The choice of curriculum development, and utilization - local change programs, as the two areas in which training will be offered was made for several reasons. Curriculum development can be considered the most fundamental approach to instructional innovation inasmuch as it involves basic decisions about both the ends and the means of instruction. It offers answers to key questions about what is to be taught to whom and how. The choice of offering training to design and conduct local change programs also is strategic. The pay-off of the processes of instructional innovation is found in changes in the instruction provided students. Local change programs provide the route for bringing innovations into the schools.

A second reason for picking the two areas is the fact that they involve all aspects of the instructional program viewed as a system of interacting components. Both involve decisions about the ends to be served and about how the various components of instruction are to be involved in serving

A third reason for choosing curriculum development and local change programs as the initial training areas is the fact that, taken together, they require developing training units and materials that cover the great bulk of the tasks in the List of Tasks in Educational R & D (Appendix A). Curriculum development involves also teacher training, changes in the instructional environment, test development, formative and summative evaluation, strategic research studies, and competencies in project management. Local change programs involve changing curricula and instructional procedures, initiating new teacher training, and employing competencies in evaluation and in project management. Also, they involve many tasks in the area of diffusion (field testing, demonstration, and dissemination).

A fourth reason for the choice is that these two areas are ones in which the consortium possesses exceptional strength. Curriculum development, with particular attention to individualized instruction, is strongly represented in the work of the Learning Research and Development Center (LRDC) and Research for Better Schools (RBS). Several other Consortium agencies, notably the American Institutes for Research and Applied Science Associates, are particularly strong in this area. Expertise in designing and conducting local change programs is especially well represented in the Pennsylvania State Department of Education, in the work of RBS in diffusing the program of Individually Prescribed Instruction (IPI), in the innovative programs of the school systems in the Consortium, and in Project Follow Through at LRDC.

The decision has been made to provide training initially for two sorts of positions in educational R & D agencies--Project Director (PD) and Professional Assistant (PA). As was stated in Part I of this report (see page 14), training of Technical Assistants (TA) and Para-Professionals (PP) will not be provided during the first year or so of the operational test. As needs for training personnel to fill such positions become evident, and as training units appropriate for such positions are located or built in connection with the initial four training programs, training programs for TA's and PP's may be introduced.

Each of the four training programs includes work in four types of training contexts. These are course work, laboratory exercises or projects, internship experiences, and individualized training program guidance. The guidance aspects of the trainee's program, under an assigned adviser, through program planning and advisement provide a match-up of the trainee's needs and learner characteristics, on the one hand, and training tasks presented through course work, labs, and internships, on the other. Generally, course work and labs precede, and provide a foundation for, internship experiences. However, interaction of the different approaches to training is given explicit attention in the design and conduct of each trainee's program.

Associated with the types of training contexts are the types and levels of training offered in a given task or task area. These have been presented in detail on pages 9 - 11 of Part I of this report. They are presented in summary form on the page that follows to assist the reader in following the entries on Level of Training in the descriptions of the four training programs. Note that the types of training that can be offered for a task cover the range from course work through labs to internship or job experiences.

A word should be said about the general strategy of training program development being followed. This proposal represents a practical approach to introducing training in areas where, heretofore, virtually no training has been offered. The Consortium might have undertaken the task on a piece-by-piece basis, developing the needed training units to a high level of technical refinement before venturing to implement the programs. Instead, the plan is to launch the program with the best approaches and materials that are available while proceeding at all times to improve the quality of

SUMMARY OF TYPES AND LEVELS OF TRAINING IN TASKS OR TASK AREAS

The following is a summary characterization of the types and levels of training that will be made available for tasks or task areas for which training materials will be provided. The characterization offered here specific training objectives for each level abbreviating the information given in the fuller description appearing on pages 9-11 of Part I of this report.

Generally, the sequence as presented below constitutes an hierarchy; when a given level of training is stated for a task, it means that the preceding levels also have been covered by the trainees involved. The major exception is that training at the job level (J) can occur following training that reaches only to the P1 or P2 level as well as following training that reaches the T level.

Training Level	Training Type	Symbol	Training Objectives
1	Core - Introductory	C1	Can describe general content of task or task area and state types of problems found there
2	Core - Advanced	C2	Can state body of facts, principles, and guidelines in the task (or task area) but cannot apply these in solving real problems
3	Analysis of tasks	A	Can analyze task products re variables and interactions of tasks that are critical for task performance and its evaluation
4	Practice - Elementary	P1	Works simplified problems that teach basic skills and knowledge and their application to basic problems
5	Practice - Advanced	P2	Works problems approximating the complexity of the real world but not requiring interaction with people there
6	Theory and Transfer	T	Can independently apply principles and methods to the solution of real problems with no supervision or review required
7	Job-like practice	J	Learns to solve problems in the real world, and shows both technical competency and the ability to cope with interpersonal factors

the approaches and materials employed. Thus it will be necessary to rely heavily on relatively unsystematic training materials and approaches in the form of study guides, selected readings, and seminar discussions. As development activities proceed within the Consortium and elsewhere, an increasing body of carefully-structured training units will become available for replacing the earlier and less-adequate units. An advantage of the strategy of program development being employed is that, by venturing into the training arena before adequate training materials are at hand, a setting for tryout and revision through formative evaluation dealing with a wide range of training problems is provided.

The accounts of the four training programs given on the succeeding pages each follows a common format. After an introductory section, contents of the program are identified in terms of task areas and tasks, and level of training. Then follows a brief description of how the program will be conducted. It is obvious that these specifications on content and conduct of the programs are tentative and subject to major change when the programs are developed. Finally, for each program, the expected number and sources of trainees for the 1971-72 year is indicated.

After the descriptions of the four training programs, this part of the report concludes with sections on individualized trainee guidance, on implementing the training programs, and on evaluation of the work of the operational phase.

PROGRAM 1. SHORT-TERM PROGRAM TO TRAIN PROFESSIONAL ASSISTANTS TO BUILD CURRICULAR MATERIALS

Purposes and Justification for the Program

A major portion of the work in curriculum development performed by agencies such as Research and Development Centers, Regional Educational Laboratories, curriculum departments in large school systems, university-based project teams, and publishing houses is that of building curricular materials in the form of units or lessons. Most of this work can be, and usually is, performed by what we are calling Professional Assistants (research assistants, interns, etc.) who work under the supervision of the director of a curriculum project or sub-project.

While Professional Assistants engaged in curriculum development would become fully prepared for their jobs only through an extensive training program, it is practicable to offer a short-term program that concentrates on the relatively circumscribed set of competencies required to build curriculum materials after the major decisions on design and content have been made. In the present program, the Professional Assistant will start with a set of pre-determined learning objectives. His work in building units, for the purposes of this short-term program, will stop after the initial tryout and revision of the units he builds.

The justification for a short-term training program of this sort is that, each year, hundreds--perhaps thousands--of Professional Assistants are employed in curriculum development projects across the country with little or no specific training for their jobs. Generally, the on-the-job training of these new assistants is unsystematic, decentralized, and highly uneven from agency to agency, project to project. Under these conditions, learning to do the job takes longer than necessary and requires much more time from supervisors than should be used. Often, also, the assistant never reaches a high level of proficiency because of lack of adequate training.

Products Intended

Products of the development and tryout of Program 1 will be several. An immediate gain will be the improved performance of trainees in the program as they begin (or continue) work in their positions. Of greater general significance, tested training components will be generated in this vital area of development. These units can be made available for use in any R & D agency that is engaged in curriculum building. Also, these components will form a substantial part of the major program under development by this Consortium to train specialists in the development of curricula--Program 2.

Initiation of the Program

Program 1 will be launched by offering training to Professional Assistants engaged in curriculum development at the Learning Research and Development Center, Research for Better Schools, the Pennsylvania State Department of Education, and to similar personnel in other Consortium agencies or elsewhere. In some instances trainees will be newly-hired; in other instances, they will already have had some job experience in curriculum building.

The program will be initiated during the summer of 1971, and will begin with a four- to six-week full-time institute. Training will continue during the fall months with supervised job experience and with a bi-weekly training day, September - December. The institute will offer training in Educational R & D Foundations and basic training in building curricular units. The in-service continuation of the program will ensure that the basic training is applied effectively on the job.

Content of Program 1

Content to be included in Program 1 can be represented by listing the tasks for which training will be provided and, for each task, the level to which it is to be mastered. For explanation of the symbols for these levels, reference is made to the summary description offered in the introduction to this part of the report.

The tasks identified below are from the List of Tasks in Educational R & D; they are stated in abbreviated form. All entries under Level of Training apply to preparation for positions as Professional Assistants.

DEVELOPMENT: CURRICULUM OR TRAINING PROGRAMS

TASK AREAS AND TASKS		LEVEL OF TRAINING
I. Arrive at general program objectives	1. Identify need for program	C2
	2. Judge importance, feasibility	
	3. Identify classes of objectives	
II. Specify instructional objectives	4. Specify terminal objectives	
	5. Analyze terminal objectives	
	6. Set up sequences, units.	A
	7. Make tests, observational schedules	P2-J
III. Design and build the program	8. Formulate instructional strategies	A
	9. Prepare instructional materials	P2-J
	10. Test materials on a few subjects	P2-J
	11. Interpret test data, revise materials	P2-J

EVALUATION: C. TEST DEVELOPMENT

		LEVEL OF TRAINING
I. Arrive at purposes of the test	1. Define purposes, uses of the test 2. Prepare content, behavioral specs.	A
II. Plan the test	3. Survey limits for use, administration 4. Develop scoring procedures 5. Determine test length 6. Plan item construction	
III. Build the test	7. Develop items, directions	
IV. Try the test	8. Plan tryout stages 9. Tryout the test (alternate forms)	

EDUCATIONAL R & D FOUNDATIONS

1. Define and relate educational development, diffusion utilization, evaluation, and research	C2
2. Describe functions, programs, and roles of types of educational R & D agencies	C2
7. Specify the requirements for building a programed instructional unit	C2
8. Specify the requirements for instructional programs representing individualization, mastery, and student self-direction	C2
10. Specify the instructional requirements for teaching inquiry (problem-solving)	C2
13. State various types of learning objectives in terms of student behaviors	P1
14. Demonstrate knowledge of learning theory concerning concepts, principles, discrimination, transfer, motivation, and reinforcement in relation to instruction	C2

SOCIAL/PERSONAL COMPETENCIES

A. Inter-personal B. Work Habits/Attitudes	. . . . *J

* The J, in this instance, applies to performance in any part of the training program since judgments of personal/social competencies can be made both during the institute and on the job.

Conduct of Program 1

Instruction in Program 1 will generally follow the guidelines set forth in the Resnick strategy for training to prepare instructional materials (see Appendix C, pages 5-8). The general sequence of training components is indicated below, beginning with the summer institute and continuing with on-the-job supervision and bi-weekly training days.

SUMMER INSTITUTE

Weeks (approx)	Content	Level of Training	Media
1	R & D Foundations, Tasks 1,2,8,10	C2	PI/Rdg./Sem
	Development: Curriculum, Tasks 1-11	C1	PI/Seminar
	Development: Curriculum, Tasks 1-5	C2	PI/Seminar
1-2	Development: Curriculum, Task 6 (sequence, units)	A	Seminar/Lab
	Analysis of instructional materials	A	Seminar/Lab
1-2	R & D Foundations, Task 13 (behavioral defs.)	P1	PI/Lab
	Editing instructional materials	P1	Seminar/Lab
1-2	Evaluation: Test Development, Tasks 1-9	A	PI/Seminar
	Formulate Instructional Strategies	A	PI/Lab
	Build, test, revise instructional materials	P2	Seminar/Lab

On-the-job Instruction. Following the completion of the institute, trainees will receive individual instruction on-the-job from their job supervisors. This instruction will be correlated with that offered in the institute and will have the purpose of facilitating the application, on the job, of the competencies learned in the institute. To assist job supervisors in performing this function, they will be provided with guidelines and supporting materials for assessing and analyzing the trainees' personal/social competencies on the job, and for offering counseling to remedy deficiencies.

Bi-Weekly Training Days. Following the completion of the institute, trainees will attend a one-day workshop every two weeks for two and one-half months, a total of five additional training days. These workshops will have the purpose of integrating institute training with job performance through study of case data derived from trainees' curriculum building work and through refresher training units involving key aspects of curriculum building that were covered in the institute.

Trainees for Program 1

During the initial implementation of the program during 1971-72, it is planned to have 10-15 trainees. It is anticipated that 4-6 will be from the Learning Research and Development Center, 2 from Research for Better Schools, and 4-6 from the Pennsylvania State Department of Education. Two or three trainees may come from other Consortium agencies. Community organizations such as the Bidwell Culture and Training Center, Model Cities, and the Urban League, all of Pittsburgh, plan to provide one or more trainees.

PROGRAM 2. LONG-TERM PROGRAM TO TRAIN PROJECT DIRECTORS AND PROFESSIONAL ASSISTANTS TO DEVELOP CURRICULUM

Purposes and Justification for the Program

This program is designed to provide systematic training for persons who will hold key roles in curriculum development projects. Few carefully designed programs presently exist in this area. (An example of the few exceptions to the rule is Leslie J. Briggs, Handbook of Procedures for the Design of Instruction, American Institutes for Research, 1970). The present program will offer two or three years of full-time training leading to the masters or doctoral degree, or to equivalent certification. The intent is to provide the trainee with a professional basis for making key decisions about instructional goals and methods, and with expertise in designing, implementing, and assessing curricula in different subject-matter fields that are intended for different student populations. Stress will be placed on learning to make curriculum decisions that are relevant particularly to critical problems involving educationally disadvantaged groups in our society. Types of learning goals that will receive systematic attention in the program are tool skills in language and mathematics, competencies in self-directed learning, inquiry (problem solving), and personal/social attitudes and competencies. Trainees will learn to build into curricular materials provisions for the use of instructional approaches and media that are suitable for individualized instruction.

Justification for this program is found in the fact that thousands of persons lacking specific prior training for their jobs now are employed in curriculum development projects and, further, in the fact that each year more thousands enter such jobs without relevant training and must learn their roles on-the-job in an apprentice capacity. Curriculum projects calling for experts to fill roles as project directors or professional assistants are illustrated by LRDC's IPI and PEP programs, the Humanizing Learning Program at RBS, Project PLAN of AIR and Westinghouse Learning Corporation, Science - A Process Approach by AAAS, and Man - A Course of Study originated at the Educational Development Center. Much work in curriculum development goes on in universities, in school systems, in state education departments, and in the education industry. Program 2 offers training for jobs in all such projects and agencies.

Special contributions of Program 2 to the upgrading of curriculum development will come from it emphases on training for the introduction of different kinds of learning goals into the curriculum (self-direction, inquiry, etc.), on ensuring that curriculum content is relevant to the needs of different student sub-populations, and on providing materials that are suitable for individualized instruction. Also, Program 2 will offer training in taking account of curriculum as part of an instructional system that includes the learning environment and requires teacher education that is appropriate to curriculum objectives.

Products Intended

It is intended that the development of Program 2 during the operational phase will yield a tested design for training leaders in curriculum development together with training procedures and materials that can be employed in various pre-service and in-service settings. The initial test of the program during the operational phase thus can provide the launching pad for diffusing all or part of the program to other training sites. A small number of trainees will be accommodated during the pilot test of the program. This number can be significantly increased with the same funding once the emphasis shifts from program and materials development to training.

Initiation of Program 2

It is planned to introduce Program 2 in the fall trimester of 1971-72 at the University of Pittsburgh. The initial group of trainees, recruited from across the country, probably will consist mainly of graduate students enrolling for the two-year, masters level, course of training. A few probably will enroll for the three-year, doctoral level, program. During the first year, 1971-72, all trainees will engage mainly in course work and laboratory activities with internship experiences occurring the second year and beyond.

Content of Program 2

The content of Program 2 is represented, as was that of Program 1, by listing task areas and tasks to be covered and indicating for each task or group of tasks the level to which it is to be masted. Note that, in Program 2, provisions are made for the training both of Project Directors (PD) and Professional Assistants (PA). It will be seen that, with many tasks, both categories of trainees will be called upon to achieve mastery at the same level. This is on the assumption that prospective Professional Assistants differ mainly from prospective Project Directors in the length of their training programs, in their preparation to manage projects, and in whether or not they intend to conduct a major original project during their training as a requirement for the doctorate.

Once again, the reader is reminded that the task areas and tasks listed for Program 2 are from the List of Tasks in Educational R & D (Appendix A) and that the symbols for level of training are explained on page 3 above.

DEVELOPMENT: Curriculum or Training Programs

		LEVEL OF TRAINING	
		PD	PA
I. Arrive at general program objectives	1. Identify need for program	T-J	A
	2. Judge importance, feasibility		
	3. Identify classes of objectives		
II. Specify instructional objectives	4. Specify terminal objectives	T-J	P2-J
	5. Analyze terminal objectives		
	6. Set up sequences, units		
	7. Make tests, observational schedules		
III. Design and build the program	8. Formulate instructional strategies	T-J	P2-J
	9. Prepare instructional materials		
	10. Test materials on a few subjects		
	11. Interpret test data, revise materials		
IV. Build instructional environment	12. Design needed instructional environment	Ref. Instruc. Envir. Systems	
	13. Prepare materials for environment		
V. Build teacher/staff training program	14. Identify teacher/staff behaviors	Ref Tasks 1-11	
	15. Prepare training materials		
VI. Pilot test the program; revise, retest	16. Design pilot test of program	A	A
	17. Conduct pilot test		
	18. Analyze, interpret feedback data		
	19. Revise curriculum/training program		
	20. Revise instructional environment		
	21. Revise training program		
	22. Retest revised program on pilot basis		
VII. Report findings	23. Prepare report on the program	P2	P2

DEVELOPMENT: Instructional Environment Systems

		LEVEL OF TRAINING	
		PD	PA
I. Arrive at objectives for program	1. Identify need for program	A	C2
	2. Judge importance, feasibility		
	3. Identify purposes to be served		
	4. Specify objectives of the environment		
II. Develop strategy for building the system	5. Specify features of required environment		
	6. Specify ways to incorporate features		
	7. Analyze the alternative ways		
	8. Select an alternative		
III. Build the system	9. Determine resources required		
	10. Develop the system		
IV. Provide curriculum to implement system	11. Identify curriculum needs	See work flow for curriculum development	
	12. Build the curriculum		
V. Provide training program for teachers	13. Identify teacher behaviors		
	14. Build teacher education program		
VI. Pilot test the system; revise, retest	15. Design the pilot test	C2	C1
	16. Conduct the pilot test		
	17. Analyze and interpret feedback data		
	18. Revise environment system		
	19. Revise curriculum for system		
	20. Revise training program for system		
	21. Retest system on pilot basis		
VII. Report findings	22. Prepare report on the system		

DIFFUSION: Field Testing

		LEVEL OF TRAINING	
		PD	PA
I. Arrive at general program objectives	1. Select and describe field test product 2. Specify purposes of field test	A	C2
II. Specify required product adaptations	3. Identify sub-populations of users 4. Identify needed modifications		
III. Prepare to conduct the field test	5. Design needed product modifications 6. Creat and test the modifications 7. Design changes in implementing product 8. Develop and test these changes 9. Develop assessment program for product implementation and outcomes		
IV. Conduct and assess the field test	10. Select settings for the field test 11. Secure cooperation from test sites 12. Select, train field testers 13. Conduct the field test 14. Revise program or its implementation 15. Repeat the field test		
V. Prepare a report	16. Analyze and report data on field test, recommending changes to developer or producer		

DIFFUSION: Demonstration

		LEVEL OF TRAINING	
		PD	PA
I. Arrive at general program objectives	1. Select, describe product to demonstrate 2. Specify purposes of the demonstration	A	C2
II. Plan for types of demonstration	3. Identify sub-populations for demonstr. 4. Specify criteria and select sites		
III. Design plan for demonstration	5. Design plan for implementing demonstr. 6. Design plan to assess demonstration		
IV. Prepare for and conduct demonstration	7. Secure demonstration sites 8. Train personnel to implement product 9. Implement the demonstration 10. Analyze feedback data 11. Revise the demonstration plan 12. Repeat the demonstration		
V. Prepare a report	13. Analyze data, report the demonstration, recommending product modifications to developer or producer		

DIFFUSION: Dissemination

		LEVEL OF TRAINING	
		PD	PA
I. Arrive at program objectives	1. Identify dissemination need 2. Judge importance, feasibility 3. Specify dissemination objectives	A	C2
II. Plan the dissemination program	4. Identify target population 5. Formulate dissemination strategy		
III. Build and test the dissemination materials	6. Develop dissemination materials 7. Develop evaluation instruments 8. Pretest prototype materials 9. Revise materials		
IV. Conduct and assess the dissemination program	10. Implement the dissemination program 11. Assess program effectiveness 12. Revise the program, repeating steps 10 and 11.		
V. Report findings	13. Prepare a report of findings, with recommendations to producers and marketers of the product		

UTILIZATION: Local Change Programs

		LEVEL OF TRAINING	
		PD	PA
I. Arrive at program objectives	1. Specify objectives of program area	C1	C1
	2. Assess present accomplishment of objectives, identify shortcomings		
	3. Assess resources available for improving accomplishment of objectives		
	4. List relevant change programs		
	5. Assess costs of these change programs		
	6. Assess local resources, constraints		
	7. Rank order potential change programs		
	8. Select the change program		
II. Plan the local change program	9. Design the change program		
	10. Design program to assess change prog.		
III. Conduct and assess the change program	11. Obtain the required resources		
	12. Conduct pre-implementation activities		
	13. Implement the change program		
	14. Analyze, interpret feedback data		
	15. Revise program, implement again		
IV. Report findings	16. Prepare report on program effectiveness with recommendations for use		

EVALUATION		LEVEL OF TRAINING	
		PD	PA
A. Formative			
I. Context evaluation	1. Identify present goals of system	A	A
	2. Assess value of goals		
	3. Plan for assessing goal achievement		
	4. Assess current goal achievement		
	5. Identify problem area		
II. Input evaluation	6. Identify goals of development effort		
	7. Evaluate the development goals		
	8. Specify how to assess goal attainment		
	9. Evaluate plans for achieving goals		
III. Process evaluation	10. Assess program implementation		
	11. Monitor program structuring		
	12. Further monitor program implementation		
IV. Product evaluation	13. Assess degree of attainment of goals		
	14. Prepare evaluation reports		
B. Summative			
I. Arrive at purposes of the evaluation	1. Specify characteristics to evaluate	A	A
	2. Specify purposes of evaluation effort		
	3. Identify dimensions to be evaluated		
II. Develop evaluation plan	4. Identify data collection means		
	5. Analyze and compare the alternatives		
	6. Select data collection approach		
	7. Develop procedures for data analysis		
	8. Evaluate constraints *re* procedures		
	9. Modify procedures *re* Step 8		
	10. Plan evaluation study activities		
III. Conduct the evaluation	11. Conduct pre-study activities		
	12. Conduct evaluation data collection		
	13. Analyze data		
	14. Interpret findings		
IV. Report findings	15. Prepare a report with recommendations		
C. Test Development			
I. Arrive at purposes of the test	1. Define purposes and uses of the test	A	A
	2. Prepare content, behavioral specs.		
II. Plan the test	3. Survey limits for use, administration		
	4. Develop scoring procedures		
	5. Determine test length		
	6. Plan item construction		
III. Build the test	7. Develop items, directions		
IV. Try the test	8. Plan tryout stages		
	9. Tryout the test (alternate forms)		
V. Analyze data and revise test	10. Analyze data from tryout		
	11. Recycle if data calls for it		
	12. Prepare final version of test		
VI. Report findings	13. Prepare technical report, test manual		

RESEARCH

		LEVEL OF TRAINING	
		PD	PA
I. Formulate research hypothesis	1. Select the topic and variables	A	A
	2. Review previous related theory and research		
	3. Identify situational factors that limit the approach		
	4. Specify problem re variables		
	5. Predict variable relationships		
II. Design the research plan	6. Plan the research approach		
	7. Assess feasibility of plan		
	8. Define variables re operations and measures		
	9. Identify subject population		
	10. Specify the research design		
	11. Modify design to constraints		
	12. Plan to implement the design		
III. Conduct the study	13. Conduct pre-research activities a. train personnel b. confirm validity of procedures c. conduct liaison/logistics d. revise design as needed		
	14. Implement research plan		
	15. Monitor operations for problems		
	16. Change design to overcome difficulties		
	17. Complete data collection		
IV. Analyze data and prepare report	18. Transfer data to appropriate form for analysis		
	19. Implement statistical analysis		
	20. Depict findings with graphs, etc.		
	21. Summarize, interpret and report findings		

EDUCATIONAL R & D FOUNDATIONS	LEVEL OF TRAINING PD	LEVEL OF TRAINING PA
1. Define and relate educational development, diffusion, utilization, evaluation, and research	C2	C2
2. Describe functions, programs, and roles of types of educational R & D agencies	C2	C2
3. Demonstrate competence in search skills in locating educational R & D information	P1	P1
4. Describe the features of the educational reform movement in the U.S. since 1955	C2	C2
5. Describe instructional systems in terms of their major components	C2	C2
6. Compare or contrast two or more instructional systems in terms of how their components are represented	A	A
7. Specify the requirements for building a programed instructional unit	C2	C2
8. Specify the requirements for instructional programs representing individualization, mastery, and student self-direction	C2	C2
9. Compare and contrast instructional systems in terms of the degree to which they involve individualization, mastery, and student self-direction	A	A
10. Specify the instructional requirements for teaching inquiry	C2	C2
11. Compare and contrast curricula and instructional approaches in terms of the extent to which they are appropriate for teaching inquiry	A	A
12. Describe school/community relationships in terms of their impact on instructional programs	C2	C2
13. State various types of learning objectives in terms of student behaviors	P2	A
14. Demonstrate knowledge of learning theory re concepts, principles, discrimination, transfer, motivation, and reinforcement in relation to instruction.	C2	C2
15. Demonstrate knowledge of the relationships of basic and applied research to instruction	C2	C2

SOCIAL/PERSONAL COMPETENCIES	LEVEL OF TRAINING	
	PD	PA
A. Interpersonal		
1. Inform co-workers effectively	J	J
2. Request needed information, help from co-workers		
3. Assist co-workers and accept their assistance		
4. Contribute ideas to group planning		
5. Assess one's competencies in contributing to group		
6. Accept, perform different roles in group		
7. Contribute to work flow of the group		
8. Evaluate group performance, suggest improvements		
9. Contribute to positive interaction of group members		
B. Work Habits/Attitudes		
10. Perform and complete work on schedule	J	J
11. Accept and assume responsibility for work		
12. Work independently		
13. Subordinate personal interests to work requirements		
14. Maintain professional ethics in work activities		
15. Show interest in work as by improving competencies, participating in professional organizations		

PROJECT MANAGEMENT

		LEVEL OF TRAINING	
		PD	PA
I. Plan the project	1. State objectives as products, processes 2. Select a planning technique 3. Diagram activities flow 4. Estimate staff, funds, time, etc. needs 5. Define staff roles and organization 6. Plan needed external interactions 7. Prepare project plans w. deadlines 8. Establish planning feedback mechanism 9. Periodically assess plan effectiveness 10. Revise plan or components as needed	P2-J	P1
II. Build budgets and contracts	11. Identify funding sources 12. Estimate project costs 13. Analyze organization/funding for compliance to relevant guidelines 14. Prepare detailed budget 15. Select a cost control system 16. Prepare formal contracts 17. Procure facilities, equipment	C2	C2
III. Build manpower resources	18. Recruit and select staff 19. Orient staff to the project 20. Assess staff training needs 21. Select, design training experiences 22. Conduct staff training 23. Build working relations with other project/agencies	P2	P1
IV. Supervise project	24. Make assignments 25. Delegate authority 26. Maintain quality/efficiency standards 27. Parcel work to other project/agencies 28. Adjust excessive/insufficient work loads 29. Provide appropriate reinforcement 30. Maintain accountability mechanism	P2-J	P1
V. Communicate information	31. Develop communication network within agency 32. Periodically report progress to administrators/funders 33. Explain decisions to staff 34. Develop liaison with interested groups, individuals	P1	P1

Conduct of Program 2

The heart of Program 2 is found in the work flow for DEVELOPMENT: Curriculum or Training Programs (see page 11 above). The most critical parts of this work flow are Tasks 1-11 covering the arriving at general program objectives, specifying instructional objectives, and designing and building the curriculum. Tasks 12 and 13 on building the instructional environment call for study of Tasks 1-10 of the work flow for Development: Instructional Environment Systems. Tasks 14 and 15, on teacher training for the curriculum that has been developed, simply calls for re-cycling through Tasks 1-11, this time to develop the required teacher education sub-program. Tasks 16-22 involve pilot testing, revising, and retesting the curriculum/instructional environment/teacher education components. Extensive training for these tasks is not necessary beyond the analysis level since there is much overlap with earlier tasks. Actually conducting a pilot test of a curriculum would be highly desirable; however it is unlikely to be feasible within the internships that can be made available. Training at the analysis level will be offered and, if opportunities occur to engage in pilot testing in an internship, they will be used. Task 23 on preparing a report can be taken care of in a laboratory setting with simulated case data.

In reviewing the task coverage for this program, it should be noted that all tasks in all the work flows are in the training program at least at the core (C1 or C2) level. (A major job of program development is to build training materials for the core levels that introduce the trainee to the full scope of educational R & D represented by the task list in Appendix A.) Many of the tasks are to be studied at the analysis (A) level as is the case with the three work flows in Evaluation. Obviously, trainees will receive evaluation training at a higher level in those tasks of the curriculum development work flow involving assessment competencies (Tasks 2, 7, 10, and 11 on page 11, in particular.)

During 1971-72, the first year of training, Program 2 will be conducted almost entirely through course work, field observation, and laboratory activities. Details on how these will be interlaced to provide the pre-internship coverage of tasks must be worked out as part of the process of specific program development to be launched in February 1971, if the project is funded. At this time, general guidelines that probably will be followed can be indicated.

The first major objectives to be accomplished in the program concern Tasks 1-3 of the curriculum development work flow. Training in these tasks, beginning at the core levels, will involve concentrated work on R & D Foundations (see page 18) to provide bases for identifying curriculum issues, for locating needs for curriculum development, and for deciding upon general classes of learning objectives that relate to meeting the needs that have been identified. In this introduction to the program, in addition to reading and taking part in seminars, trainees will visit communities and schools to conduct planned observations and interviews designed to acquaint them with educational issues and the ways in which instructional programs do or do not deal with them.

The suggested approach to instruction in Tasks 1-3 recommended by Heathers (Appendix C, pages 1-3) indicates the sorts of curriculum units (programed, syllabus and readings, seminars, and labs) that can be employed in training to analyze curriculum materials. Such units set forth desirable features of curricula with respect to learning goals, instructional approaches, provisions for student differences, and provisions for facilitating implementation. They proceed to the examination and evaluation of sample curricula in terms of such criteria and the identification of shortcomings in existing curricula (Task 1). After working on units concerned with judgments of importance and feasibility (Task 2), the trainees will proceed to work on approaches to specifying how new curricula could account for needed learning goals, instructional approaches, provisions for student differences, and provisions for facilitating implementation (Task 3).

Training in Tasks 1-3 will be accompanied by core units covering other work flows in the task list--instructional environment systems, diffusion (field testing, demonstration, and dissemination), and utilization of innovations in local change programs. The purpose of this survey will be to provide an orientation to the general contexts in which curriculum development proceeds.

Training in Tasks 4-7 of the work flow on specifying instructional objectives will begin by sampling across types of subject matter, types of instruction and psychological classes of behavior as outlined in the Resnick proposal on instructional strategy (see Appendix C, pages 5-6). Also included will be analyses of types of test items needed to assess accomplishment of different types of objectives.

A theory seminar (see Appendix C, page 6) follows, covering technical literature on needs for specified objectives (Mager, Hively, Glaser and Nitko, et. al.). The relevance of behavioral specifications to problem solving will be explored. Methods of specifying and categorizing objectives (Bloom, Gagne, computer simulation, etc.), methods of analyzing objectives (Gagne, Resnick, et. al.), and approaches to sequencing objectives (Piaget-based, subject-matter structure, information processing, etc.), will be studied. With respect to Task 7, the theory of testing will be dealt with, giving particular attention to item types and criterio

The analysis seminar (see Appendix C, page 6) occurring next will begin with Task 7 and work backward to Task 4. The review of various tests will concern describing the domain of the test, and determing whether the test measures a class of behaviors or a specific set. Test item types will be examined to identify and compare alternatives for testing the same class of behaviors. The seminar will deal with problems of reliability, validity, and cost/effectiveness, and will consider what conclusions (assessment only, or diagnostic also) can be drawn from pass/fail scores.

The next segment of training on Tasks 4-7 will be a lab in writing tests and observational schedules (see Appendix C, pages 7-8). It will begin with the trainee being presented with objectives and tests and called upon to try, critique, and revise the tests. The next step will be to edit the tests without trying them. Finally, trainees will write tests, edit each others' products, and revise them.

A final training segment for Tasks 4-7 will be a lab on analyzing and sequencing objectives. This will deal with various types of objectives.

Associated with the work on testing involved in Tasks 4-7, trainees will study the work flow for EVALUATION: Test Development (page 16 above) at the core level. The work on tests at the analysis level will be part of the lab experiences referred to above.

The third section of the work flow for curriculum development on designing and building the curriculum, Tasks 8-11, is covered directly in the Resnick strategy proposal for preparing instructional materials (Appendix C, pages 5-8). Given the completion of Tasks 5-7 on terminal objectives, Task 8 calls for designating a strategy for each type of instructional unit prepared in Task 6. These strategy decisions then provide bases for preparing instructional materials in Task 9. Testing materials on a few subjects and revising these materials on the basis of feedback data (Tasks 10 and 11) can be done in a laboratory context.

Instruction in Tasks 12-22 has been dealt with in the opening paragraph above on the conduct of Program 2. Task 23 calls for a lab in which trainees prepare reports from data provided them.

Course work in Program 2 will not be confined to work on units that have been selected or developed for the university-based program in Instructional Development. In addition, under individual advisement, trainees will take university courses in general psychology, educational or developmental psychology, tests and measurement, research design and methods, computer science, instructional media, and other areas. Such courses will be taken to build essential foundations for training in curriculum development.

Outside the work flows more directly related to curriculum development, the training program will give systematic attention to developing competencies in project management, particularly with prospective Project Directors. At a somewhat lower training level, prospective Professional Assistants will take labs on aspects of project management that will prepare them to assume leadership responsibilities at least at the sub-project level.

In Program 2, internships in curriculum development teams at R & D agencies will be the heart of the second year's work. These will be preceded, during the trainee's first year, by observation of curriculum development work in R & D agencies and, if possible, by some participation in the work of a curriculum team. Such observation or participation is a valuable way to learn initially about purposes, procedures, and problems of curriculum development as background for seminar and lab work on the analysis, editing, and writing of curricular materials. Also, such experiences would help prepare the trainee to participate in the selection of his internship for the second year.

To be adequate, an internship in curriculum development should place the trainee as a regular working member of a curriculum team where he can employ what he has learned in course work and labs covering, insofar as possible, the full range of tasks in curriculum building (including tasks in related areas of R & D). Those responsible for selecting and supervising an internship should make every effort to see that the trainee is given relevant training experiences. Often it will be important that a trainee hold more than one internship position during a year in order to extend the range of application of his competencies.

Course work, seminars, and labs, as well as advisement and counseling, will accompany the internship and provide a systematic interaction of doing with analyzing and evaluating what one is doing.

Trainees working for the doctorate in Instructional Development will be required to conduct a major original project in curriculum development (or related research) during their third year. Normally the project will be conducted in a field or internship setting. This may require setting up a special internship setting for the trainee.

Trainees for Program 2

It is expected that about 6 trainees will launch Program 2 in September 1971. The small number is dictated by two considerations: these trainees will require major financial support for living and tuition and the anticipated funds available will provide for only a few; and the requirements of full-time individualized instruction in the program places heavy time demands on the instructional staff.

Trainees will be recruited on a national basis through various forms of advertising the program in educational publications, through posters for bulletin boards, and by personal contact with college officials, administrators of educational agencies including state education departments and school systems, and leaders of community organizations concerned with educational change. A particular effort will be made to recruit members of minority groups. Six agencies in the project Consortium indicated the likelihood that one or more persons associated with their organizations would probably seek to enroll in Program 2.

PROGRAM 3. SHORT-TERM PROGRAM TO TRAIN PROJECT DIRECTORS TO DESIGN LOCAL INSTRUCTIONAL CHANGE PROGRAMS

Purposes and Justification for the Program

A chief function of utilization specialists assigned to state education departments, intermediate R & D units serving schools, or to R & D roles in school systems, is to provide expertise in the design and conduct of local innovative programs. An especially frequent expression of this function concerns the design of Title I or Title III projects and the preparation of project proposals. Another important source of leadership in the design of local change programs is provided by educational specialists in community organizations. In the past few years, educational change in many urban centers has been especially influenced by community organizations representing the concerns of minority groups, notably Blacks in inner cities. Leaders in these organizations have many times assumed the role of designers of local educational change programs. The purpose of Program 3 is to provide training to enable leaders both within and outside the educational establishment to do a better job in the design of local change programs. The program is intended primarily for individuals who already hold positions calling for expertness in designing innovative programs.

Particular stress will be placed on the analysis of local needs and resources, the generation of alternative approaches to meeting local needs, and the selection of an approach that satisfies criteria of relevance, potency, feasibility, and efficiency. Also, stress will be placed on teaching trainees to state project objectives in operational terms and on designing appropriate means for assessing project implementation and outcomes. Because of the centrality of school/community relationships in relation to local educational change, Program 3 will place major stress on considering change programs in this context. Trends toward decentralization and community control of schools, and toward accountability will receive especial attention.

Products Intended

An immediate gain from Program 3 will be improved performance by program graduates in their roles as consultants to school systems, leaders within school systems, and leaders as community organizations. Also tested training components will be developed in this critical area of educational R & D. Numerous of these components can be made available soon for use in any R & D agency concerned about training of the sort offered in the program. Also, these components will become an important part of the long-term program to train specialists in the design and conduct of local change programs--Program 4.

Initiation of the Program

Program 3 will be initiated with a four- to six-week institute that will begin during the summer of 1971. It is expected that trainees can most conveniently participate in the program in two-week training blocks. This will mean that the institute will be staggered throughout the summer and into the fall of 1971. Following the institute, trainees will return to the central training location for a one-day training workshop every two weeks until the end of the calendar year.

During 1971-72, Program 3 will be conducted in two sections, one for utilization specialists in state education departments, intermediate units, and school systems; the other for educational leaders in community organizations.

Content of Program 3

Task areas and tasks to be included in Program 3, and the level of training for each, are indicated below. The symbols employed for level of training are explained on page 3 of this part of the report. Note that the training offered is only at the Project Director (PD) level since it is assumed that the great majority of trainee applicants will hold leadership positions in respect to designing change programs rather than serving as Professional Assistants within teams.

UTILIZATION: Local Change Programs

		LEVEL OF TRAINING PD
I. Arrive at program objectives	1. Specify objectives of program area	T-J
	2. Assess present accomplishment of objectives, identify shortcomings	
	3. Assess resources available for improving accomplishment of objectives	
	4. List relevant change programs	
	5. Assess costs of these change programs	
	6. Assess local resources, constraints	
	7. Rank order potential change programs	
	8. Select the change program	
II. Plan the local change program	9. Design the change program	
	10. Design program to assess change prog.	
III. Conduct and assess the change program	11. Obtain the required resources	C1
	12. Conduct pre-implementation activities	
	13. Implement the change program	
	14. Analyze, interpret feedback data	
	15. Revise program, implement again	
IV. Report findings	16. Prepare report on program effectiveness with recommendations for use	

DEVELOPMENT: Curriculum or Training Programs

I. Arrive at general program objectives	1. Identify need for program	C1
	2. Judge importance, feasibility	
	3. Identify classes of objectives	
II. Specify instructional objectives	4. Specify terminal objectives	
	5. Analyze terminal objectives	
	6. Set up sequences, units	
	7. Make tests, observational schedules	
III. Design and build the program	8. Formulate instructional strategies	
	9. Prepare instructional materials	
	10. Test materials on a few subjects	
	11. Interpret test data, revise materials	

		LEVEL OF TRAINING PD
DEVELOPMENT: Instructional Environment Systems		
I. Arrive at objectives for program	1. Identify need for program 2. Judge importance, feasibility 3. Identify purposes to be served 4. Specify objectives of the environment	C1
II. Develop strategy for building the system	5. Specify features of required environment 6. Specify ways to incorporate features 7. Analyze the alternative ways 8. Select an alternative	
III. Build the system	9. Determine resources required 10. Develop the system	
DIFFUSION: Field Testing		
I. Arrive at general program objectives	1. Select and describe field test product 2. Specify purposes of field test	C2
II. Specify required product adaptations	3. Identify sub-populations of users 4. Identify needed modifications	
III. Prepare to conduct the field test	5. Design needed product modifications 6. Creat and test the modifications 7. Design changes in implementing product 8. Develop and test these changes 9. Develop assessment program for product implementation and outcomes	
DIFFUSION: Demonstration		
I. Arrive at general program objectives	1. Select, describe product to demonstrate 2. Specify purposes of the demonstration	C1
II. Plan for types of demonstration	3. Identify sub-populations for demonstr. 4. Specify criteria and select sites	
III. Design plan for demonstration	5. Design plan for implementing demonstr. 6. Design plan to assess demonstration	
DIFFUSION: Dissemination		
I. Arrive at program objectives	1. Identify dissemination need 2. Judge importance, feasibility 3. Specify dissemination objectives	
II. Plan the dissemination program	4. Identify target population 5. Formulate dissemination strategy	

EVALUATION		LEVEL OF TRAINING PD
A. Formative		
I. Context evaluation	1. Identify present goals of system	A
	2. Assess value of goals	
	3. Plan for assessing goal achievement	
	4. Assess current goal achievement	
	5. Identify problem area	
II. Input evaluation	6. Identify goals of development effort	A
	7. Evaluate the development goals	
	8. Specify how to assess goal attainment	
	9. Evaluate plans for achieving goals	
III. Process evaluation	10. Assess program implementation	C2
	11. Monitor program structuring	
	12. Further monitor program implementation	
IV. Product evaluation	13. Assess degree of attainment of goals	
	14. Prepare evaluation reports	
B. Summative		
I. Arrive at purposes of the evaluation	1. Specify characteristics to evaluate	C2
	2. Specify purposes of evaluation effort	
	3. Identify dimensions to be evaluated	
II. Develop evaluation plan	4. Identify data collection means	
	5. Analyze and compare the alternatives	
	6. Select data collection approach	
	7. Develop procedures for data analysis	
	8. Evaluate constraints re procedures	
	9. Modify procedures re Step 8	
	10. Plan evaluation study activities	

EDUCATIONAL R & D FOUNDATIONS	LEVEL OF TRAINING PD
1. Define and relate educational development, diffusion, utilization, evaluation, and research	C2
2. Describe functions, programs, and roles of types of educational R & D agencies	C2
3. Demonstrate competence in search skills in locating educational R & D information	P1
4. Describe the features of the educational reform movement in the U.S. since 1955	C2
5. Describe instructional systems in terms of their major components	C2
6. Compare or contrast two or more instructional systems in terms of how their components are represented	A
7. Specify the requirements for building a programed instructional unit	C2
8. Specify the requirements for instructional programs representing individualization, mastery, and student self-direction	C2
9. Compare and contrast instructional systems in terms of the degree to which they involve individualization, mastery, and student self-direction	A
10. Specify the instructional requirements for teaching inquiry	C2
11. Compare and contrast curricula and instructional approaches in terms of the extent to which they are appropriate for teaching inquiry	A
12. Describe school/community relationships in terms of their impact on instructional programs	C2
13. State various types of learning objectives in terms of student behaviors	P1

SOCIAL/PERSONAL COMPETENCIES	LEVEL OF TRAINING PD
A. Interpersonal	
1. Inform co-workers effectively	J
2. Request needed information, help from co-workers	
3. Assist co-workers and accept their assistance	
4. Contribute ideas to group planning	
5. Assess one's competencies in contributing to group	
6. Accept, perform different roles in group	
7. Contribute to work flow of the group	
8. Evaluate group performance, suggest improvements	
9. Contribute to positive interaction of group members	
B. Work Habits/Attitudes	
10. Perform and complete work on schedule	J
11. Accept and assume responsibility for work	
12. Work independently	
13. Subordinate personal interests to work requirements	
14. Maintain professional ethics in work activities	
15. Show interest in work as by improving competencies, participating in professional organizations	

PROJECT MANAGEMENT

		LEVEL OF TRAINING PD
I. Plan the project	1. State objectives as products, processes	C2
	2. Select a planning technique	
	3. Diagram activities flow	
	4. Estimate staff, funds, time, etc. needs	
	5. Define staff roles and organization	
	6. Plan needed external interactions	
	7. Prepare project plans w. deadlines	
	8. Establish planning feedback mechanism	
	9. Periodically assess plan effectiveness	
	10. Revise plan or components as needed	
III. Build manpower resources	18. Recruit and select staff	C1
	19. Orient staff to the project	
	20. Assess staff training needs	
	21. Select, design training experiences	
	22. Conduct staff training	
	23. Build working relations with other project/agencies	
IV. Supervise project	24. Make assignments	C1
	25. Delegate authority	
	26. Maintain quality/efficiency standards	
	27. Parcel work to other project/agencies	
	28. Adjust excessive/insufficient work loads	
	29. Provide appropriate reinforcement	
	30. Maintain accountability mechanism	

Conduct of Program 3

The general sequence of training components is given below, beginning with the institute and continuing with bi-weekly training days. The outline presented here obviously is tentative; numerous changes can be expected when the program materials and procedures are developed during the early months of the operational phase.

TRAINING INSTITUTE

Weeks (approx.)		Level of Training	Media
2	R & D Foundations, Tasks 1-5, 12	C2	PI/Rdg./Sem.
	Work Flows in Development, Diffusion.	C1,C2	PI/Rdg./Sem.
	Analysis of designs for local change programs.	A	Sem./Lab Sim.*
1	R & D Foundations, Tasks 6-11, 12, 13	C2,A	PI/Rdg./Sem.
	Editing designs of local change programs	P1	Sem./Lab Sim.
1	Work Flows in Formative & Summative Evaluation	C2,A	PI/Rdg./Sem.
	Designing local change programs, given simulated data	P2,T	Sem./Lab Sim.
1	Work Flow in Utilization, Tasks 11-16	C1	PI/Rdg./Sem.
	Work Flow in Project Mgmt., Tasks 1-10, 18-30	C1,C2	PI/Rdg./Sem.
	Strategies for working with school people in designing local change programs	A	/Lab Sim.

* Laboratory simulation

Bi-Weekly Training Workshops. Following the completion of the institute, trainees will attend a one-day workshop every two weeks for two and one-half months, a total of five additional training days. These workshops will serve to integrate training obtained in the institute with job performance through study of case data derived from trainees' work in the design of local change programs. Also, new training units will be added in areas revealed to require special attention.

Trainees for Program 3

Two groups of trainees will be conducted through Program 3 during the initial implementation of the program, beginning in the summer of 1971. One group of 12-15 trainees will consist of R & D personnel currently employed by the Pennsylvania State Department of Education, by intermediate educational units serving school systems, and by school systems. These will be specialists having responsibilities for designing (and conducting) local change programs. Between 20 and 30 such trainees have been estimated to be available within Consortium agencies. Thus it will be possible to launch Program 3 with trainees drawn entirely from the Consortium; major advantages of this are geographical access to these trainees and financial support from their employers.

The second group consists of educational leaders of community organizations who have major roles in influencing the choice and design of local educational change programs. Organizations in Pittsburgh that are interesting in providing trainees for Program 3 are Pittsburgh Model Cities, the Urban League, Forever Action Together (a Black community service organization), and the Bidwell Cultural and Training Center. It is anticipated that 8-10 trainees will come from such community organizations.

PROGRAM 4. LONG-TERM PROGRAM TO TRAIN PROJECT DIRECTORS AND PROFESSIONAL ASSISTANTS TO DESIGN AND CONDUCT LOCAL CHANGE PROGRAMS

Purposes and Justification for the Program

This program is designed to provide systematic training for persons who will have key roles in the design and conduct of local instructional change programs. The program will offer two or three years of full-time training leading to the masters or doctoral degree, or to equivalent certification. The aim is to provide the trainee with a professional basis for making key decisions about what changes are needed in local instructional programs and what approaches to meeting those needs are likely to provide effective and feasible. Also the program will develop expertise in designing, implementing, and assessing change programs of different types and conducted in different contexts. Stress will be placed on designing and conducting change programs that are relevant to critical educational problems involving educationally disadvantaged groups. Trainees will learn to give attention to various types of learning goals (tool skills in language and mathematics, competencies in self-directed learning, inquiry or problem-solving skills, and personal/social attitudes and behavior). Also they will learn to build into local change programs provisions for the use of instructional approaches and media that are suitable for individualized instruction.

Justification for this program is found in the fact that thousands of persons lacking specific training for their work now are employed in positions calling upon them to take leadership in the design or conduct of local instructional change programs. Each year thousands more enter positions where they are called upon to assume similar roles. The positions referred to include specialists in state education departments, intermediate units, school systems, and community-action organizations, as well as consultants from universities or private firms. Virtually every school system in the country each year undertakes some form of change program. Title I and Title III projects offer one nearly-universal occasion for developing change programs. Program 4 will offer training for any positions that involve taking part as Project Director (or consultant) or Professional Assistant in designing, conducting, and assessing any form of change program.

Special contributions of Program 2 to the upgrading of local change efforts will result from its emphases on training to identify needs for change that take specific account of school/community factors, to consider various types of learning goals, and to seek to meet the special needs of minority groups. The program will offer training to identify and compare alternative approaches to meeting the needs that have been identified.

Products Intended

It is intended that the development of Program 4 during the operational phase will provide a tested design for training experts in planning and conducting local change programs of various types. Also the program will provide training procedures and materials that can be employed in various pre-service and in-service settings. Only a small number of trainees can be accommodated in this program during the operational phase. This number could be significantly increased with the same funding once the program and materials development activities taper off, allowing an increased proportion of funds to go for training.

Initiation of Program 4

It is planned to introduce Program 4 in the fall trimester of 1971-72 at the University of Pittsburgh. The initial group of students, recruited on a national basis, probably will consist chiefly of graduate students enrolling for the two-year, masters level, course of training. A few may be expected to enroll for the three-year, doctoral-level, program. During the first year, 1971-72, all trainees will engage mainly in course work and laboratory activities, with internship experiences provided during the second and third years. To tie the program in with real problems in real situations, an emphasis on field observation will be built into the program from its inception.

Content of Program 4

A listing of task areas and tasks from the List of Tasks in Educational R & D (Appendix A) that will be covered in Program 4 follows. For each task area or task, the level at which it is to be mastered is indicated. Note that provisions are made for training both Project Directors (PD) and Professional Assistants (PA). It will be seen that, with many tasks, both categories of trainees will be called upon to achieve mastery at the same level. It is assumed that training for Professional Assistants should differ from that for Project Directors mainly in its length, in the amount of training in project management, and in whether or not the trainee is to conduct a major original project as a requirement for the doctorate.

The reader is reminded that the symbols for Level of Training are explained on page 3 above.

UTILIZATION: Local Change Programs

		LEVEL OF TRAINING	
		PD	PA
I. Arrive at program objectives	1. Specify objectives of program area	T-J	T-J
	2. Assess present accomplishment of objectives, identify shortcomings		
	3. Assess resources available for improving accomplishment of objectives		
	4. List relevant change programs		
	5. Assess costs of these change programs		
	6. Assess local resources, constraints		
	7. Rank order potential change programs		
	8. Select the change program		
II. Plan the local change program	9. Design the change program	T-J	P2-J
	10. Design program to assess change prog.		
III. Conduct and assess the change program	11. Obtain the required resources	P2-J	P1-J
	12. Conduct pre-implementation activities		
	13. Implement the change program		
	14. Analyze, interpret feedback data		
	15. Revise program, implement again		
IV. Report findings	16. Prepare report on program effectiveness with recommendations for use	P2	P2

DEVELOPMENT: Curriculum or Training Programs

		LEVEL OF TRAINING	
		PD	PA
I. Arrive at general program objectives	1. Identify need for program 2. Judge importance, feasibility 3. Identify classes of objectives	A	C2
II. Specify instructional objectives	4. Specify terminal objectives 5. Analyze terminal objectives 6. Set up sequences, units 7. Make tests, observational schedules		
III. Design and build the program	8. Formulate instructional strategies 9. Prepare instructional materials 10. Test materials on a few subjects 11. Interpret test data, revise materials		
IV. Build instructional environment	12. Design needed instructional environment 13. Prepare materials for environment	C2	C2
V. Build teacher/staff training program	14. Identify teacher/staff behaviors 15. Prepare training materials		
VI. Pilot test the program; revise, retest	16. Design pilot test of program 17. Conduct pilot test 18. Analyze, interpret feedback data 19. Revise curriculum/training program 20. Revise instructional environment 21. Revise training program 22. Retest revised program on pilot basis	C1	C1
VII. Report findings	23. Prepare report on the program		

DEVELOPMENT: Instructional Environment Systems

		LEVEL OF TRAINING	
		PD	PA
I. Arrive at objectives for program	1. Identify need for program	A	C2
	2. Judge importance, feasibility		
	3. Identify purposes to be served		
	4. Specify objectives of the environment		
II. Develop strategy for building the system	5. Specify features of required environment		
	6. Specify ways to incorporate features		
	7. Analyze the alternative ways		
	8. Select an alternative		
III. Build the system	9. Determine resources required	C1	C1
	10. Develop the system		
IV. Provide curriculum to implement system	11. Identify curriculum needs		
	12. Build the curriculum		
V. Provide training program for teachers	13. Identify teacher behaviors		
	14. Build teacher education program		
VI. Pilot test the system; revise, retest	15. Design the pilot test		
	16. Conduct the pilot test		
	17. Analyze and interpret feedback data		
	18. Revise environment system		
	19. Revise curriculum for system		
	20. Revise training program for system		
	21. Retest system on pilot basis		
VII. Report findings	22. Prepare report on the system		

DIFFUSION: Field Testing

		LEVEL OF TRAINING	
		PD	PA
I. Arrive at general program objectives	1. Select and describe field test product 2. Specify purposes of field test	A	C2
II. Specify required product adaptations	3. Identify sub-populations of users 4. Identify needed modifications		
III. Prepare to conduct the field test	5. Design needed product modifications 6. Creat and test the modifications 7. Design changes in implementing product 8. Develop and test these changes 9. Develop assessment program for product implementation and outcomes		
IV. Conduct and assess the field test	10. Select settings for the field test 11. Secure cooperation from test sites 12. Select, train field testers 13. Conduct the field test 14. Revise program or its implementation 15. Repeat the field test		
V. Prepare a report	16. Analyze and report data on field test, recommending changes to developer or producer		

DIFFUSION: Demonstration

		PD	PA
I. Arrive at general program objectives	1. Select, describe product to demonstrate 2. Specify purposes of the demonstration	A	C2
II. Plan for types of demonstration	3. Identify sub-populations for demonstr. 4. Specify criteria and select sites		
III. Design plan for demonstration	5. Design plan for implementing demonstr. 6. Design plan to assess demonstration		
IV. Prepare for and conduct demonstration	7. Secure demonstration sites 8. Train personnel to implement product 9. Implement the demonstration 10. Analyze feedback data 11. Revise the demonstration plan 12. Repeat the demonstration		
V. Prepare a report	13. Analyze data, report the demonstration, recommending product modifications to developer or producer		

DIFFUSION: Dissemination

		LEVEL OF TRAINING	
		PD	PA
I. Arrive at program objectives	1. Identify dissemination need 2. Judge importance, feasibility 3. Specify dissemination objectives	A	C2
II. Plan the dissemination program	4. Identify target population 5. Formulate dissemination strategy		
III. Build and test the dissemination materials	6. Develop dissemination materials 7. Develop evaluation instruments 8. Pretest prototype materials 9. Revise materials		
IV. Conduct and assess the dissemination program	10. Implement the dissemination program 11. Assess program effectiveness 12. Revise the program, repeating steps 10 and 11.		
V. Report findings	13. Prepare a report of findings, with recommendations to producers and marketers of the product		

EVALUATION		LEVEL OF TRAINING	
		PD	PA
A. Formative			
I. Context evaluation	1. Identify present goals of system	A	A
	2. Assess value of goals		
	3. Plan for assessing goal achievement		
	4. Assess current goal achievement		
	5. Identify problem area		
II. Input evaluation	6. Identify goals of development effort		
	7. Evaluate the development goals		
	8. Specify how to assess goal attainment		
	9. Evaluate plans for achieving goals		
III. Process evaluation	10. Assess program implementation		
	11. Monitor program structuring		
	12. Further monitor program implementation		
IV. Product evaluation	13. Assess degree of attainment of goals		
	14. Prepare evaluation reports		
B. Summative			
I. Arrive at purposes of the evaluation	1. Specify characteristics to evaluate	A	A
	2. Specify purposes of evaluation effort		
	3. Identify dimensions to be evaluated		
II. Develop evaluation plan	4. Identify data collection means		
	5. Analyze and compare the alternatives		
	6. Select data collection approach		
	7. Develop procedures for data analysis		
	8. Evaluate constraints re procedures		
	9. Modify procedures re Step 8		
	10. Plan evaluation study activities		
III. Conduct the evaluation	11. Conduct pre-study activities		
	12. Conduct evaluation data collection		
	13. Analyze data		
	14. Interpret findings		
IV. Report findings	15. Prepare a report with recommendations		
C. Test Development			
I. Arrive at purposes of the test	1. Define purposes and uses of the test	A	A
	2. Prepare content, behavioral specs.		
II. Plan the test	3. Survey limits for use, administration		
	4. Develop scoring procedures		
	5. Determine test length		
	6. Plan item construction		
III. Build the test	7. Develop items, directions		
IV. Try the test	8. Plan tryout stages		
	9. Tryout the test (alternate forms)		
V. Analyze data and revise test	10. Analyze data from tryout		
	11. Recycle if data calls for it		
	12. Prepare final version of test		
VI. Report findings	13. Prepare technical report, test manual		

RESEARCH		LEVEL OF TRAINING	
		PD	PA
I. Formulate research hypothesis	1. Select the topic and variables 2. Review previous related theory and research 3. Identify situational factors that limit the approach 4. Specify problem re variables 5. Predict variable relationships	A	A
II. Design the research plan	6. Plan the research approach 7. Assess feasibility of plan 8. Define variables re operations and measures 9. Identify subject population 10. Specify the research design 11. Modify design to constraints 12. Plan to implement the design		
III. Conduct the study	13. Conduct pre-research activities a. train personnel b. confirm validity of procedures c. conduct liaison/logistics d. revise design as needed 14. Implement research plan 15. Monitor operations for problems 16. Change design to overcome difficulties 17. Complete data collection		
IV. Analyze data and prepare report	18. Transfer data to appropriate form for analysis 19. Implement statistical analysis 20. Depict findings with graphs, etc. 21. Summarize, interpret and report findings		

EDUCATIONAL R & D FOUNDATIONS	LEVEL OF TRAINING PD	LEVEL OF TRAINING PA
1. Define and relate educational development, diffusion, utilization, evaluation, and research	C2	C2
2. Describe functions, programs, and roles of types of educational R & D agencies	C2	C2
3. Demonstrate competence in search skills in locating educational R & D information	P1	P1
4. Describe the features of the educational reform movement in the U.S. since 1955	C2	C2
5. Describe instructional systems in terms of their major components	C2	C2
6. Compare or contrast two or more instructional systems in terms of how their components are represented	A	A
7. Specify the requirements for building a programed instructional unit	C2	C2
8. Specify the requirements for instructional programs representing individualization, mastery, and student self-direction	C2	C2
9. Compare and contrast instructional systems in terms of the degree to which they involve individualization, mastery, and student self-direction	A	A
10. Specify the instructional requirements for teaching inquiry	C2	C2
11. Compare and contrast curricula and instructional approaches in terms of the extent to which they are appropriate for teaching inquiry	A	A
12. Describe school/community relationships in terms of their impact on instructional programs	A	A
13. State various types of learning objectives in terms of student behaviors	P2	P2
14. Demonstrate knowledge of learning theory re concepts, principles, discrimination, transfer, motivation, and reinforcement in relation to instruction.	C2	C2
15. Demonstrate knowledge of the relationships of basic and applied research to instruction	C2	C2

SOCIAL/PERSONAL COMPETENCIES	LEVEL OF TRAINING	
	PD	PA
A. Interpersonal		
1. Inform co-workers effectively	J	J
2. Request needed information, help from co-workers		
3. Assist co-workers and accept their assistance		
4. Contribute ideas to group planning		
5. Assess one's competencies in contributing to group		
6. Accept, perform different roles in group		
7. Contribute to work flow of the group		
8. Evaluate group performance, suggest improvements		
9. Contribute to positive interaction of group members		
B. Work Habits/Attitudes		
10. Perform and complete work on schedule	J	J
11. Accept and assume responsibility for work		
12. Work independently		
13. Subordinate personal interests to work requirements		
14. Maintain professional ethics in work activities		
15. Show interest in work as by improving competencies, participating in professional organizations		

PROJECT MANAGEMENT

		LEVEL OF TRAINING	
		PD	PA
I. Plan the project	1. State objectives as products, processes	P2-J	P1-J
	2. Select a planning technique		
	3. Diagram activities flow		
	4. Estimate staff, funds, time, etc. needs		
	5. Define staff roles and organization		
	6. Plan needed external interactions		
	7. Prepare project plans w. deadlines		
	8. Establish planning feedback mechanism		
	9. Periodically assess plan effectiveness		
	10. Revise plan or components as needed		
II. Build budgets and contracts	11. Identify funding sources	P2	P1
	12. Estimate project costs		
	13. Analyze organization/funding for compliance to relevant guidelines		
	14. Prepare detailed budget		
	15. Select a cost control system		
	16. Prepare formal contracts		
	17. Procure facilities; equipment		
III. Build manpower resources	18. Recruit and select staff	P2	P1
	19. Orient staff to the project		
	20. Assess staff training needs		
	21. Select, design training experiences		
	22. Conduct staff training		
	23. Build working relations with other project/agencies		
IV. Supervise project	24. Make assignments	P1-J	P1
	25. Delegate authority		
	26. Maintain quality/efficiency standards		
	27. Parcel work to other project/agencies		
	28. Adjust excessive/insufficient work loads		
	29. Provide appropriate reinforcement		
	30. Maintain accountability mechanism		
V. Communicate information	31. Develop communication network within agency	P1	P1
	32. Periodically report progress to administrators/funders		
	33. Explain decisions to staff		
	34. Develop liaison with interested groups, individuals		

Conduct of Program 4

The central part of Program 4 is found in the work flow for UTILIZATION: Local Change Programs (page 37). Program 3, it will be recalled, focused on Tasks 1-10 of this work flow since trainees in that program will not be taught to conduct change programs. Program 4, on the other hand, offers training that proceeds beyond designing change programs to include intensive work on conducting, assessing, and reporting findings of change programs of various types.

In reviewing the task coverage in Program 4, it should be noted that all tasks in all work flows in the List of Tasks in Educatational R & D are included in the training program, at least at the core (C1 or C2) level. Many of the tasks are to be studied at the higher analysis (A) level as is the case with the work flows in Evaluation. Other tasks carry the trainee to the P1, P2, or T level and call for further training at the job (J) level.

During 1971-72, the first year of training, Program 4 will be conducted almost entirely through course work, field observation and participation, and laboratory activities. The details on how this work will be conducted can only be sketched in broad outline at this time since those details must be worked out during the period of intensive program development and materials development that will be launched in February 1971, if the project is funded.

The first major objectives of Program 4 concern Tasks 1-3 in the work flow for UTILIZATION: Local Change Programs. These cover arriving at needs for change programs and assessing resources available locally and elsewhere for meeting those needs. In this initial part of the training program, intensive work in Educational R & D Foundations (see page 44) will be offered with stress particularly on Tasks 1-6 and 12. Also there will be systematic field observation to learn about school/community relationships and the conduct of instructional programs of different types at different age levels (preschool, elementary, and secondary). In addition, the initial part of the training program will introduce the trainees to the work flows for Development and Diffusion at the core level.

The second segment of the training program will focus in Tasks 4-8 of the work flow for UTILIZATION: Local Change Programs. The emphasis in this part of the program will be on laboratory activities in which the trainee analyzes, evaluates, and edits designs of local change programs in terms of their relevance for meeting designated needs and in terms of their theoretical and practical aspects. Further work in Educational R & D Foundations will be offered here involving Tasks 8-11 on individualization and inquiry, and Task 14 on learning theory (see page 44). Also, during this period of training work in Formative Evaluation will be introduced (see page 42).

In the third major segment of the first year's work, the trainee will learn to design change programs of various types. This covers Tasks 9 and 10 of the task flow for UTILIZATION: Local Change Programs. At this time, core work in the work flow for PROJECT MANAGEMENT will be introduced (see page 46). Work in Summative Evaluation and Test Development will be offered here.

The fourth major part of the year's work will cover tasks 11-16 of the work flow for UTILIZATION: Local Change Programs that are concerned with implementing and testing change programs. Since trainees will not be able to proceed through these tasks in the real world at that time, the training materials will focus in laboratory simulation. An emphasis in the work of this part of the program will be on tasks in Project Management, especially for trainees at the Project Director level. An introduction to the work flow for Research (see page 43) will be included at this time. This section of the program also will stress matters involving working with people in schools and communties as related to conducting evaluating, and reporting change programs.

Trainees in Program 4 will, under advisement, take university course work outside that offered in Instructional Development. Such courses may be in sociology, cultural antrhopology, general psychology, educational psychology, child development, tests and measurement, research methods, instructional media, and other areas. These courses will be selected in terms of their value as foundational to work on local change programs and in terms of matching the individual needs and interest of the trainee.

In Program 4, internships for the second or third year must be in educational R & D agencies where the trainee can gain experience in applying the training he received during his first year to a variety of kinds of change programs involving different populations, different aspects of the instructional program, and different modes of intervention to accomplish the desired changes. Ideally, the trainee will have more than one internship setting. The problem of obtaining adequate supervision may prove important. A solution to this problem probably can be found by placing some trainees in R & D contexts focused on diffusing instructional innovations since there is a marked overlap of tasks in the diffusion and the utilization work flows. Within the Consortium, Research for Better Schools and the Learning Research and Development Center both can offer good internships in their diffusion task forces. Of course supervised internships can be provided trainees in Program 4 in the school systems at Philadelphia and Pittsburgh, and the Pennsylvania State Department of Public Education.

During their third training year, candidates for the doctorate will be required to conduct a major project involving local change programs. Normally this project will be conducted in a field setting, perhaps as part of an internship.

Trainee for Program 4

It is expected that about 6 trainees will begin work in Program 4 in September 1971. The small number, as with Program 2, is dictated by a shortage of funds to provide the heavy financial support required, and by the shortage of project personnel to give the extensive individualized attention each trainee will require.

Trainees will be recruited on a national basis. A particular effort will be made to recruit members of minority groups and leaders of local community-action organizations. Five agencies in the project Consortium have indicated that they are likely to provide one or more trainees for

Program 4. It is likely that school systems, once they learn about Program 4, will want to send key personnel responsible for local innovative changes to Program 4. Often, however, the lack of funds will require school systems to turn to the less costly Program 3.

General Plan for Individualizing the Training Programs

A central purpose of the training programs is that of individualizing the conduct of instruction. The features of an individualized program have been stated earlier in Part I of this report (page 3). Essentially, an "educational guidance" approach is what is called for. Such an approach requires that each trainee's inputs be assessed to determine the extent to which he already has achieved program objectives as well as his characteristics as a learner that will determine his most effective routes toward achieving program objectives.

Individualized guidance begins with the recruitment and selection process. Once a prospective trainee has expressed interest in enrolling in a training program, the process of individualization begins. Admission to a program as well as initial program planning should be viewed as a contract between program advisors and the new trainee.

Conducting training on an individualized basis requires that both the trainee's long-term program and his short-term assignments be specifically designed for him on the bases of pre-test information and diagnoses of his learner characteristics. The learning tasks assigned him must take account of his entering behaviors with respect to those tasks and must provide appropriate learning materials and instruction. Previsions should be made whereby the trainee can take the time he needs to master the assigned tasks, then move on immediately to further tasks. This requires that instruments and procedures be available to assess the trainee's work, task-by-task.

The individualized approach listed above requires that each trainee have an adviser who is chiefly responsible for his total program and who maintains close working relations with the trainee's instructors in order to maintain the unity and direction of his program. It requires also that each member of the instructional staff understand and accept the principles and procedures of individualized instruction.

A key aspect of individualization in the training programs concerns internship placement. It is vital that each trainee hold an internship that is well-suited to his training needs. To bring this about, often it will be necessary to shape internships to fit a trainee's requirements. This may be done sometimes by moving a trainee into a different internship setting within an agency. Also, individualizing the internship requires regular supervision, and advisement or instruction directed toward remedying deficiencies.

Graduation from a training program with credits, a degree, or a certificate will depend upon demonstrated mastery of program requirements, including evidence of possessing the requisite personal/social competencies.

Job placement obviously is an individualized matter. For it to be effective, the project staff will need to possess extensive information about jobs available not only locally but nationally.

To obtain evidence on the success of the training program, and feedback information for improving it, as well as bases for aiding the program graduate, systematic follow-up of graduates will be conducted.

The above constitutes a set of general requirements for individualization that must be met in the training programs. Working out detailed procedures for accomplishing these purposes is a central task of the initial months of the operational phase.

General Plan for Implementing the Training Programs

A key aspect of program development during the early months of the operational phase will be working out detailed procedures for implementing the training programs. The requirements for developing and utilizing the essential implementation procedures are indicated in the section of Scope of Work on program development.

Planning to implement the programs requires, first of all, the establishment of the requisite instructional programs within the University of Pittsburgh. Designing, initiating, and staffing the new program in Instructional Development within the School of Education is a critical task. Providing procedures, arrangements, and schedules for conducting instruction utilizing university staff members and others is important. Orienting and training the instructional staff to conduct instruction in terms of the purposes and procedures of the training programs likewise is essential.

Arrangements must be worked out with Consortium members and others whereby trainees are recruited, selected, and admitted with the active participation of their sponsors. This will be necessary often because support for trainees must come from sources other than the grant funds.

The roles that project staff members are to play in implementing the training programs must be clarified. Most staff members will wear two or three hats--as regular members of the LRDC staff, as professors at the University of Pittsburgh, and as members of the project staff.

General Plan for Evaluation of the Training Programs

Each of the proposed training programs described in this document includes an outline of steps in the formative and summative evaluation process which will be included in the competencies which the trainee will be expected to master. These same steps have been, and will be, used in carrying out the evaluation of these training programs, both while they are being developed (formative evaluation) and in the final assessment of their effectiveness (summative evaluation).

An early step in the formative evaluation of a program development effort must be the identification of the goals of the program and an assessment of their potential value in meeting targeted needs. As this document indicates, much work has already been done on this step. The goals of each program have been specified in terms of "purposes" and "products intended." These goals have been assessed through a process of review by all members of the consortium. Further evaluation will take place as the development effort is pursued and they can be examined in terms of their possibility of attainment.

Another key step in formative evaluation is the assessment of the specific plans for achieving program goals. Detailed specification of these plans will be carried out in the next phase of program development and the evaluation of these plans will take place at that time. This evaluation will include an assessment of their potential for achieving the goals, their feasibility for actual implementation, and their clarity and specificity. This part of the evaluation effort will be aided greatly by the fact that this proposal specifies the content of each program in terms of the steps that the trainee is to be able to carry out, that is, the specific behaviors he is to acquire.

Perhaps the major component of the formative evaluation effort will be the careful monitoring of the implementation of the planned programs. Here evidence will be obtained concerning the extent to which the operating program resembles the planned program and the extent to which certain aspects of the plan have to be modified. This step in evaluation will involve feedback from instructors and trainees as well as observation by program supervisors and designated evaluators. Eventually, it will also include data on student performance and achievement. Most of the specifics concerning this phase of evaluation will be planned in the coming months of further development of the program.

Obviously, a final summative evaluation of any of the programs outlined in this document must await feedback concerning the eventual on-the-job performance of trainees who complete the program. However, the fact that most trainees will take part in some type of practicum or internship will provide some opportunity for an interim summative evaluation by studying the relevance of thier more formal training to this type of in-service performance. This feedback can come from both the trainee and the intern supervisor. Plans for later follow-up of graduates are also being formulated.

As with all aspects of the proposed training programs, the evaluation activities will be planned in detail during the next phase of development. However, certain types of evaluation are already underway. Also, program outlines and descriptions as presently formulated have been specified in such a way as to enhance possibilities for meaningful evaluation in subsequent steps. In all current and future evaluation activities, the consortium will be able to make use of the services of members who have had considerable experience in evaluation activities. (See, for example, C.M. Lindvall and Richard C. Cox, Evaluation As a Tool in Curriculum Development: The IPI Evaluation Program, AERA Monograph Series on Curriculum Evaluation, Chicago, Rand McNally, 1970)

ED 080495

FINAL REPORT ON PROJECT TO DESIGN NEW PATTERNS FOR TRAINING R & D PERSONNEL IN EDUCATION (RFP 70-12)

PART IIB

RATIONALE AND DESCRIPTION OF THE TRAINING CONSORTIUM

Learning Research and Development Center
University of Pittsburgh

December 18, 1970

SP 006 777

CONTENTS

Page

1. . . . . The Project Consortium for the Design Phase

2. . . . . The Consortium Model for the Operational Phase

2. . . . . Anticipated Participation of Consortium Members in the Operational Phase

8. . . . . Prospective Expansion of the Consortium

10. . . . . Members of the Project Consortium

13. . . . . Vitae of Representatives of Consortium Agencies

RATIONALE AND DESCRIPTION OF THE PROJECT CONSORTIUM

The Project Consortium for the Design Phase

An effective and broadly representative consortium of agencies has been a major achievement of the design phase of this project. Members were drawn from a wide range of agencies actively pursuing educational innovation; a program generating highly-trained personnel is central to the long-term plans of each member. This shared goal facilitated the coordination of different perspectives on educational change and focused the efforts of all members on the goals of the design project. With this unified purpose, the Consortium produced three important things: a model of educational change basic to training programs, the design of training programs to be developed and tested during the operational phase, and a preliminary model of a training consortium suited for developing, implementing, and testing the training programs.

The training programs presented in this report are in the strictest sense the product of the Consortium rather than of any individual agency. To accomplish its work, the Consortium operated on two levels. First, the entire Consortium held half-day working meetings monthly to provide a forum for discussion and assessment of progress. Topics to which the discussions were directed progressed throughout the project. Initially, the group generated a set of descriptions of the types of personnel most critically needed for educational innovation. The comprehensive quality of this list was guaranteed by the different points of view, ranging from research agencies to school systems, represented in the Consortium. The next task set before the Consortium was to determine the critical skills needed by R & D personnel; this involved an extensive job and task analysis. From this topic, the Consortium moved to a discussion of the training approaches most effective in filling the identified manpower needs. In the final weeks of the design phase the Consortium discussions centered on a detailed scrutiny of the specific training programs, and on the ways in which each agency could contribute and benefit.

The Consortium as a body has not been a task force; it has been a forum. Actual work has been best accomplished by individual members of the Consortium, or by small task forces. The particular expertise of each member was called upon in preparing reports on what the training programs should and could accomplish and the means to do so. These reports were integrated by the project director and distributed to Consortium members for their reactions. Feedback and resulting discussions were not restricted to the monthly meetings; hence the Consortium has been continually active in the work, assessment, and direction of the design project.

The varied composition of the Consortium led quickly to rejection of the conventional "pipeline" model of the educational change process, and its replacement with a more dynamic model. Change was not seen as a linear process of research, development, diffusion, installation, and evaluation but rather as a continual interrelation of concerns and skills involving all the agencies in the educational network. This model is central to plans for the operational phase.

The Consortium Model for the Operational Phase

The Consortium organization that developed during the design phase is the skeleton model for the operational phase. The amount and quality of design work indicates that the model is a viable one: there is every reason to believe that the Consortium will continue to work effectively throughout the operational phase. Though the functional emphasis obviously will shift from the design of training to the development and conduct of training programs, and the optimum utilization of trained personnel, the initial composition and structure of the Consortium will remain essentially unchanged. All agencies holding membership during the design phase have indicated their intent to retain membership. During the operational phase, the Consortium will be composed of those agencies listed, with their representatives, beginning on page Brief vitae of the representatives are included beginning on page

The organization and functions of the operational-phase Consortium are specified in a formal Working Agreement. Officials of 14 of the 15 present member agencies have signed this agreement to date; the fifteenth has made an oral statement of intent to participate. The Working Agreement is presented beginning on page of this section of the report; its key points are summarized below:

1. The Consortium will have two functions during the operational phase. As a formal organization, it will make policy re the objectives and procedures of the training programs. As a functional network of agencies, it will provide resources and sites for training, trainees, and jobs for graduates of training programs.

2. Membership in the Consortium will continue to be open to organizations committed to the goals of the project. Such organizations will be invited to join with the approval of the then-current membership.

3. The Consortium will elect a Steering Committee representing each of the major types of agencies holding membership. The Steering Committee will recommend policy, advise on contractual agreements, and recommend specifications for instruction.

4. The Steering Committe will elect a Project Director who must be a member of the staff of LRDC and approved by the School of Education, University of Pittsburgh.

5. The specific contributions of each of the agencies to the operational test will be delineated in individual working agreements.

Anticipated Participation of Consortium Members in the Operational Phase

A questionnaire was mailed to all Consortium members in November 1970, asking for an indication of the specific ways in which their agencies were prepared to contribute to the preparation for and conduct of the training programs. The sense of their responses for each of the four training programs is recorded in Charts 1-4 on pages 3-6. The results are summarized below, listed under the related questions.

CHART 1. CONSORTIUM MEMBERS' RESPONSES TO QUESTIONAIRE RE PROGRAM 1: SHORT-TERM TRAINING PROGRAM TO BUILD CURRICULUM MATERIALS

	Potential no. of trainees from agency	Support/released time for trainees?	Offer jobs to graduates?	Take part in materials development?	Provide instructors, lecturers?
Pittsburgh P.S.	---	---	---	---	---
B'win-W'hall P.S.	6 max.	small stipend, released time for follow-up	teaching pos. if certified	yes	yes
Avonworth P.S.	1	small stipend, released time for follow-up	part-time	yes	no
Philadelphia P.S.	---	---	---	---	---
Alghy. County P.S.	---	---	---	---	---
Penna. Dept. of Ed.	12	salary, travel released time for follow-up	yes	yes	yes
WQED	---	---	---	---	---
U. Pitt School of Ed.	(no formal reply at time of publication)				
CMU	5-10	no	no	yes	yes
Tchrs. College	---	---	---	---	---
McGraw-Hill Pub. Co.	(no formal reply at time of publication)				
AIR	---	---	possibly	yes	yes
ASA	2	small stipend, released time for follow-up	yes	yes	yes
RBS	2	salary, travel, released time for follow-up	yes	yes	yes
LRDC	4-5	small stipend	yes	yes	yes

CHART 2. CONSORTIUM MEMBERS' RESPONSES TO QUESTIONAIRE RE PROGRAM 2: LONG-TERM TRAINING PROGRAM TO BUILD CURRICULUM MATERIALS

	Potential trainees now at agency?	Potential no. internships at agency	Offer jobs to graduates?	Take part in materials development?	Provide instructors, lecturers?
Pittsburgh P.S.	yes	2-3	uncertain	no	no
B'win-W'hall P.S.	uncertain	1	teaching pos. if certified	yes	yes
Avonworth P.S.	---	---	---	---	---
Philadelphia P.S.	yes	2-5	yes	yes	yes
Alghy. County P.S.	yes	2-3	yes	no	yes
Penna. Dept. of Educ.	---	---	---	---	---
WQED	no	1	yes	no	yes
U. Pitt School of Educ.	(no formal reply at time of publication)				
CMU	no	5-10	no	yes	yes
Tchrs. College	---	---	---	---	---
McGraw-Hill Pub. Co.	(no formal reply at time of publication)				
AIR	no	3 max.	yes	yes	yes
ASA	yes	1-2	yes	yes	yes
RBS	yes	8-10	yes	yes	yes
LRDC	yes	2-3	yes	yes	yes

CHART 3. CONSORTIUM MEMBERS' RESPONSES TO QUESTIONAIRE RE PROGRAM 3: SHORT-TERM TRAINING PROGRAM TO DESIGN LOCAL CHANGE PROGRAMS

	Potential no. of trainees from agency	Support/released time for trainees?	Offer jobs to graduates?	Take part in materials development?	Provide instructors, lecturers?
Pittsburgh P.S.	1-2	released time for follow-up only	return to former position	no	no
B'win-W'hall P.S.	3 max.	small stipend, released time for follow-up	teaching pos. if certified	yes	yes
Avonworth P.S.	1	small stipend released time for follow-up	yes	yes	no
Philadelphia P.S.	2-5	released time for follow-up only	yes	yes	yes
Alghy. County P.S.	uncert.	---	---	no	yes
Penna. Dept. of Educ.	4-20	travel, salary released time for follow-up	yes	no	yes
WQED	---	---	---	---	---
U. Pitt School of Educ.	(no formal reply at time of publication)				
CMU	---	---	---	yes	yes
Tchrs. College	---	---	---	---	---
McGraw-Hill Pub. Co.	(no formal reply at time of publication)				
AIR	---	---	---	yes	yes
ASA	2	small stipend released time for follow-up	yes	yes	yes
RBS	2	travel, salary released time for follow-up	yes	yes	yes
LRDC	1-2	small stipend released time for follow-up	yes	yes	yes

CHART 4. CONSORTIUM MEMBERS' RESPONSES TO QUESTIONAIRE RE PROGRAM 4: LONG-TERM TRAINING TO DESIGN AND CONDUCT LOCAL CHANGE PROGRAMS

	Potential trainees now at agency?	Potential no. internships at agency	Offer jobs to graduates?	Take part in materials development?	Provide instructors, lecturers?
Pittsburgh P.S.	yes	2-3	uncert.	no	---
B'win-W'hall P.S.	yes	1	yes	yes	yes
Avonworth P.S.	---	---	---	---	---
Philadelphia P.S.	yes	2-5	yes	yes	yes
Alghy. County P.S.	---	---	---	---	---
Penna. Dept. of Educ.	no	---	---	---	---
WQED	no	1	yes	no	yes
U. Pitt School of Educ.	(no formal reply at time of publication)				
CMU	---	---	---	yes	yes
Tchrs. College	---	2	---	yes	yes
McGraw-Hill Pub. Co.	(no formal reply at time of publication)				
AIR	---	---	---	yes	yes
ASA	yes	1-2	yes	yes	yes
RBS	---	4	yes	yes	yes
LRDC	yes	1	yes	yes	yes

Potential number of trainees from the agencies. Though enrollment in the programs will not be restricted to employees of the Consortium agencies, the members' responses to this question indicates the programs' relevance to such agencies, and the minimum pool of applicants from which the trainees will be drawn. For Programl, seven agencies indicated that a number of their employees are interested in enrolling, with a total minimum-maximum estimate of 26-38 applicants. Eight agencies responded positively for Program 3, with an estimated 14-37 applicants. For the long-term Programs 2 and 4, the members were not asked to estimate the number of potential trainees from their agencies, but simply whether any current employees were interested. Six agencies responded positively for Program 2, five for Program 4.

Degree of support for Program 1 and 3 from the agencies. The variety of responses to this question prevents any significant summary. All but one of the agencies will offer some support to their enrolled employees; specific figures must be negotiated when the trainees enter the program.

Internships for Programs 2 and 4. Ten members will offer internships to trainees in Program 2, with a possible 25-41 positions available. Eight members will offer internships for Program 4, totalling 14-19 positions.

Possible jobs for program graduates. Seven agencies anticipate possible job offers to graduates of Program 1; eight for Program 2; eight for Program 3; and six for Program 4.

Participation in materials development. All but three of the agencies responding to the questionnaire at the time of this writing have agreed to participate in the development of training materials for one or both of the two major content areas. The roles that each agency will play in this work are discussed in the materials development section of Part IIC: Scope of Work, of this report.

Participation in on-site instruction. Ten agencies have employees who probably will offer regular instruction and/or occasional lectures in the training programs. (An eleventh, the University of Pittsburgh, School of Education, clearly will contribute in this way, though no formal response to the questionnaire has been offered to date.)

The relationship of the University of Pittsburgh, School of Education to the Consortium and the training programs in general calls for some explanation for it is multi-faceted. First, the School of Education will provide the academic context in which the programs will operate. The granting of credits, degrees, and certification requires this formal relationship. To provide the necessary official status for the programs, the School of Education will create the special program in Instructional Development consisting of the Consortium-based training programs. Though the programs therefore will be nominally sponsored by the School of Education, responsibility for them will remain with the Consortium through a directorship jointly established by the Consortium and the School of Education.

The second kind of University involvement is that of three School of Education departments with membership in the Consortium. These are the departments of Educational Communications, Educational and Developmental Psychology, and Educational Research. Each has made significant contributions to the design of the programs and will continue to contribute substantialy to them through developing materials, providing instruction, and offering related courses within their deparments.

A third kind of relationship is that of individuals contributing to the project. Many LRDC senior staff members hold faculty or administrative appointments within the School of Education. It is anticipated that a number of these individuals will contribute to the conduct and evaluation of the programs in their faculty capacities. Other School of Education faculty members who are not on the LRDC staff will make similar contributions.

Prospective Expansion of the Consortium

Though current Consortium membership provide a broad representation of educational contexts and perspectives, there is a clear advantage to expansion of membership in two directions; the Working Agreement provides for such expansion. Specifically, it is desirable to broaden the geographic scope of the Consortium and to invite the participation of organizations outside the established educational network that nonetheless have demonstrated a strong interest in educational innovation. Preliminary steps have been taken toward both ends.

As concerns geographic expansion, there is a number of paths available to the Consortium. First, several member agencies have established or are a part of national organizations. Of particular note are WQED-TV which plays a leading role in the National Educational Television network; the American Institutes for Research with main offices in Washington, D.C., Palo Alto, California, and Pittsburgh; and Research for Better Schools which has built a national diffusion network for the program of Individually Prescribed Instruction. Through these established networks, the training programs can recruit nationally and can offer nationally-distributed internships and jobs.

National scope can also be achieved by admitting new members. The present Consortium has voiced a strong interest in the possibility that the Great Cities Schools Research Council may join after the operational test gets underway. Also, a representative of the Chicago-based program in urban studies jointly sponsored by the Associated Colleges of the Mid-West and Valparaiso University, Indiana has expressed interest in the possible participation of his organization in the programs, particularly as a source of trainees and as a site for positions in urban education.

Means of expanding the types of organizational representation on the Consortium also have been explored. A number of Pittsburgh community-action groups have expressed strong interest in joining the Consortium. These include Pittsburgh Model Cities, the Urban League, Forever Action Together, (a Black community service organization), and the Bidwell Cultural and Training Center, which operates a number of educational programs at the pre-school, elementary, secondary, and adult levels. All of these organizations have active programs for the improvement of urban and minority-group education; all are eager for training programs to improve their effectiveness;

and all offer a perspective on change that can be of immense value to the training programs.

If expansion of the membership and refinement of the structure of the Consortium proceed as anticipated during the operational phase, the result will be a fully-developed, diffusable model for an educational training organization that encompasses all major points of view relative to educational improvement, and that assures optimum utilization of skilled personnel. The model will be one that is easily established in any metropolitan region.

MEMBERS OF THE PROJECT CONSORTIUM

Learning Research and Development Center	Dr. Glen Heathers, Project Director. Research Associate, LRDC; Professor of Educational and Developmental Psychology
	Dr. John O. Bolvin. Associate Director, LRDC; Executive Associate to the Dean, School of Education
	Dr. William W. Cooley. Co-Director LRDC; Professor of Education, Professor of Computer Science
	Dr. Richard C. Cox. Research Associate, LRDC; Director, Office of Measurement and Evaluation
	Dr. Robert Glaser. Director, LRDC; Professor of Psychology and of Education
	Dr. James Holland. Research Associate, LRDC; Associate Professor of Psychology
	Dr. C.M. Lindvall. Research Associate, LRDC; Professor of Education
	Dr. Anthony J. Nitko. Research Associate, LRDC; Assistant Professor of Education
	Dr. Lauren B. Resnick. Research Associate, LRDC; Assistant Professor of Psychology and of Educational Psychology
	Dr. Warren Shepler. Research Associate, LRDC; Associate Professor of Education
	Dr. John L. Yeager. Associate Director for Administration, LRDC; Associate Professor of Education
Research for Better Schools, Inc. Philadelphia, Penna.	Dr. Robert Scanlon. Director, Individualizing Learning Program
	Dr. Donald Deep. Research Associate, and Project Director of Adult Education Research
University of Pittsburgh	Dr. Robert Cox. Chairman of Educational Communications
	Dr. Barbara Seels. Assistant Professor of Educational Communications

	Dr. Michael Gladis. Associate Professor and Associate Chairman of Educational Psychology
	Dr. J. Steel Gow, Jr. Associate Provost, Division of Instructional Experimentation
	Dr. Henry Hausdorff. Chairman, Educational Research Department
	Dr. James Kelly, Jr. Associate Dean in Urban Education
Carnegie-Mellon University	Dr. Garlie Forehand Chairman, Psychology Department
Teachers College Columbia University	Dr. Francis Ianni. Director, Horace Mann-Lincoln Institute of School Experimentation
	Dr. Frank Smith. Director, Field Studies Evaluation Unit
Pennsylvania State Department of Education	Dr. Paul B. Campbell. Director, Office of Educational Research and Statistics
	Dr. Robert Hayes. Director, Bureau of Educational Research
Allegheny County Schools	Dr. Fred Krause, Assistant Superintendent, Research and Development
Avonworth Union School District	Mr. Robert F. Jordan Supervising Principal
Baldwin-Whitehall School District	Dr. Ernest Harrison Superintendent
Philadelphia Public School District	Dr. John Peper. Acting Executive Director, Research and Development
Pittsburgh Board of Public Instruction	Dr. Merwin L. Himmler. Assistant Superintendent, Research and Development
WQED-TV	Miss Rhea Sikes. Director, School Services

	Dr. Mary Sceiford. Assistant Director, School Services
American Institutes for Research	Dr. George Gropper Senior Research Scientist
Applied Science Associates	Dr. John D. Folley, Jr. President
	Dr. Kenneth I. Rifkin Associate Staff Scientist
McGraw-Hill Book Company	Mr. David Engler. Group Vice-President, Instructional Technology

VITAE OF REPRESENTATIVES OF CONSORTIUM AGENCIES

LEARNING RESEARCH AND DEVELOPMENT CENTER

Glen Heathers

Professor of Education and Research Associate, Learning Research and Development Center, University of Pittsburgh. Previously Professor of Educational Psychology and Director of Experimental Teaching Center, New York University. Coordinator of field test of The Dual Progress Plan. Author: Organizing Schools Through the Dual Progress Plan, Danville Illinois: Interstate, 1967. Ph.D., Psychology, Yale University 1939. Dr. Heathers had written extensively on school organization with stress on individualized instruction. Also he has designed and conducted programs in teacher education.

John O. Bolvin

Associate Director, Learning Research and Development Center and Professor of Education, University of Pittsburgh. Director of Individually Prescribed Instruction Program, LRDC. Member of American Educational Research Association's task force on Training of Educational Research Personnel. Ed.D., University of Pittsburgh, 1958. Dr. Bolvin's chief interests are in research and development on individualized instruction, concentrating on teacher diagnosis and lesson planning, and the use of student performance for curriculum evaluation and modification.

William W. Cooley

Co-Director, Learning Research and Development Center and Professor of Education and Computer Science, University of Pittsburgh. Previously Director of Project TALENT, University of Pittsburgh and American Institutues for Research. Co-author: Multivariate Procedures for the Behavioral Sciences Exercises (J. Wiley, 1968), Multivariate Data Analysis (J. Wiley, 1971). Ed.D., Educational Research, Harvard University, 1958. His current research conerns the applications of computer technology and statistical and measurement techniques to the support of individually prescribed instruction.

Richard C. Cox

Research Associate, Learning Research and Development Center and Associate Professor of Education, University of Pittsburgh. Formerly Director of Measurement and Evaluation Unit within LRDC. Director of Office of Measurement and Evaluation, University of Pittsburgh. Ph.D., Michigan State University, 1964. Dr. Cox has a special interest in assessing the effectiveness of a procedure of sequential testing involving placement testing, curriculum-embedded testing, and lesson-unit testing as steps in identifying the instructional needs of the individual pupil.

Robert Glaser

Director, Learning Research and Development Center and Professor of Psychology and Education, University of Pittsburgh. Past Director of Programed Learning Laboratory, and Testing and Measurement Service, University of Pittsburgh; and Research Advisor to American Institutes for Research. Currently a member of the Education and Training Board, APA; Advisor on Computing Activities, National Science Foundation; Series Editor for Instruction, Learning and Developmental Psychology, Prentice-Hall; President-Elect, AERA; President-Elect, Division of Educational Psychology, APA; Fellow, Center for Advanced Study in the Behavioral Sciences, 1969-70. Contributing editor of Teaching Machines and Programed Learning, Vols. I and II, NEA, 1960, 1965, and Training Research and Education, Wiley, 1962; Editor, Organizations for Research and Development in Education, AERA/PDK, 1966. Ph.D. in Psychology, Indiana University, 1949. Dr. Glaser is currently conducting research on the technology of instruction.

James Holland

Associate Professor of Psychology and Research Associate, Learning Research and Development Center, University of Pittsburgh. Previously Lecturer, Research Associate, and Executive Secretary to the Committee on Programed Instruction, Harvard University. Author: (with B.F. Skinner) The Analysis of Behavior: A Program for Self-Instruction, (McGraw-Hill, 1961); "Technique for the Behavioral Analysis of Human Observing", Science, 1957, 125, 348-350. "A Quantitive Measure for Programed Instruction," American Educational Research Journal, 1967, 4, 87-101. Ph.D. in Psychology, University of Virginia, 1955. Dr. Holland's principle areas of investigation are programed instruction, teaching machines, and operant conditioning.

C. Mauritz Lindvall

Research Associate, Learning Research and Development Center and Professor of Education, University of Pittsburgh. Head of Field Studies Programs at LRDC. Heretofore Chairman of Educational Research Programs and Associate Director of the Coordinated Education Center, University of Pittsburgh. Author of Testing and Evaluation, Harcourt, Brace & World, 1961; Defining Instructional Objectives, University of Pittsburgh Press, 1964; Measuring Pupil Achievement and Aptitudes, Harcourt, Brace & World, 1967. Ed.D., University of Illinois, 1953. Dr. Lindvall's research interests center in formative evaluation and its use in building curriculum.

Anthony J. Nitko

Research Associate, Learning Research and Development Center, and Assistant Professor of Education, University of Pittsburgh. Co-author with Robert Glaser of chapter on "Measurement in Learning and Instruction" to appear in the revision of Educational Measurement (R.L. Thorndike, ed.). Ph.D., State University of Iowa, 1968. His interests focus on testing in individualized instructional systems.

Lauren B. Resnick

Assistant Professor of Psychology and Director, Primary Education Project, Learning Research and Development Center, University of Pittsburgh. Author: "Programed Instruction and the Teaching of Complex Intellectual Skills." Harvard Educational Review, 1963, 33, 439-471. "Design of an Early Learning Curriculum." LRDC Working Paper, 1967. With Margaret Wang: "Approaches to the Validation of Learning Hierarchies." Proceedings of the Eighteenth Western Regional Conference on Testing Problems. Princeton, New Jersey: Educational Testing Service, 1969. Ed.D., Harvard University, 1965. Dr. Resnick has conducted research and development projects on early learning, language and the special learning problems of the disadvantaged.

Warren Shepler

Associate Professor of Education and Research Associate, Learning Research and Development Center, University of Pittsburgh. Previously Assistant Superintendent of Schools, Harrisburg, Pa. and Assistant Superintendent of Schools, Baldwin-Whitehall Schools, Pa. Publications: "Model for Individualizing Instruction." The Northern Illinois Cooperative Educational Journal, Northern Illinois University, 1970. D.Ed., University of Pittsburgh, 1955. Dr. Shepler currently is involved in developing a supervisory and teacher training model for the H.E.W. Follow Through Program. He also is Project Leader to the sponsor staff serving the five Follow Through school systems.

John Yeager

Associate Director, Learning Research and Development Center, and Associate Professor of Education, University of Pittsburgh, Ed.D., University of Pittsburgh, 1966. Dr. Yeager's research interests lie in the areas of instructional design, student learning rates, and research and development management systems.

RESEARCH FOR BETTER SCHOOLS, INC.

Robert G. Scanlon

Program Director, Individualized Learning Program, Research for Better Schools, Philadelphia, Pa. Previously Elementary Administrator, Oakleaf Elementary School, Baldwin-Whitehall School District, Pa., and Director of Elementary Education at the Middletown, New York public schools. Publications: "The Expansion of an Innovation," Audio-Visual Instruction, November, 1968; (with Mary Brown) "In-Service Education for Individualized Instruction," Educational Technology, February 1970; "Individually Prescribed Instruction: A System of Individualized Instruction," Educational Technology, December 1970. Ed.D., Elementary Education, University of Pittsburgh, 1966. Dr. Scanlon's professional interests are in curriculum development, the training of educational personnel, individualizing instruction, and the dissemination of innovations in instruction.

Donald Deep

Research Associate and Project Director of Adult Education Research, Research for Better Schools, Philadelphia, Pa; formerly Research Consultant to Project PLAN at Westinghouse Learning Corporation, Research Associate at LRDC, and Principal, Oakleaf Elementary Schools of the Baldwin-Whitehall School District. Published articles: "The Computer Can Help Individualize Instruction," Elementary School Journal, February, 1970; "The Teacher's Changing Role," Elementary School Journal, November, 1968. Ed.D., University of Pittsburgh, 1966. Dr. Deep's interests focus on individualized instruction at elementary, secondary, and adult levels. Also he specializes in curriculum development and the training of school administrators and teachers.

UNIVERSITY OF PITTSBURGH

Robert A. Cox

Chairman, Department of Educational Communications, School of Education, University of Pittsburgh. He has served as an educational consultant to UNESCO, U.S.A.I.D., and the governments of Kenya, Tanzania, Venezuela, and Columbia. Author: "Educational Technology in Developing Nations," chapter in Education in National Development, London: Routledge and Kegan Paul, 1971; "International Use of Computers for Media Control", Audiovisual Instruction, April 1967. Ed.D. in Instructional Communications, Syracuse University, 1967. Dr. Cox's professional interests are in the process of technology in the development of higher education, teacher training, and in the development, utilization, and evaluation of innovative educational systems in the United State and other nations.

Barbara A. Seels

Assistant Professor, Department of Educational Communications, School of Education, University of Pittsburgh. Previously coordinator of instruction, McGuffey School District and on the faculty of Clarion State College. Author of two annotated bibliographies on Readability and Reading published by the International Reading Association; "How Children Can Be Good Actors," 1965. Doctoral dissertation: Communication and Concepts. Ph.D. in Mass Communications, Ohio State University, 1970. Dr. Seels has specialized in the development of message design principles based on research and practice.

Michael Gladis

Associate Professor of Education and Associate Chairman of Department of Educational Psychology, University of Pittsburgh. Ph.D. in Psychology, University of Pittsburgh, 1956. Dr. Gladis' research interests focus on meaningful verbal learning and transfer of training.

J. Steele Gow, Jr.

Dean of the Division of Instructional Experimentation, University of Pittsburgh. Formerly Vice President for Planning and Development and professor of political science, Bucknell University. Formerly Director of Regional Commission on Educational Coordination, Director of Curriculum Continuity Demonstration and Co-director of Learning Research and Development Center. Co-editor (with John Goodlad) and contributor to The Changing American School, 65th Yearbook Part II, National Society for the Study of Education, 1966. Formerly news editor of The Pittsburgh Press. Ph.D., Political Science, University of Pittsburgh, 1951. Dr. Gow has a particular interest in experimentation in higher education toward individualizing instruction. Also he maintains an active role in community affairs and university-community relationships.

Henry Hausdorff

Chairman of Department of Educational Research and Professor of Education, University of Pittsburgh. Director, Office of Research and Field Services, University of Pittsburgh, 1967-68. Consultant to national evaluation of Project Follow Through, 1967-68. Co-principal investigator in evaluation of Special Programs for Disadvantaged Adolescents. Project consultant to evaluation of Title III programs in the Detroit Public Schools. Ed.D., University of Buffalo, 1962. Dr. Hausdroff's interests center on evaluating school programs and on research design concerning applied research problems.

James Kelly, Jr.

Administrative Associate, Office of the Dean, School of Education, University of Pittsburgh. His former positions include: Professor of Philosophy at Howard University; Dean of Chapel and Chairman of Philosophy Department, Florida A and M.; Dean of Pupil Personnel and Chairman of Philosophy Department at Western Virginia State College; Associate Director of National NDEA Institute for Advanced Study in Teaching Disadvantaged Youth (1966-68). Consultant to Southeast, Appalachian, and Northwest Regional Educational Laboratories. Contributor to Teachers for the Real World (AACTE), 1969, and Education for Personal and Family Living - a Working Guide for Colleges, 1957. B.D., Howard University. M.Ed. in Education and Anthropology, Marshall University. He was a student in the community development program at Western University, studied pupil personnel services at the University of Pennsylvania and Harvard, and studied higher education at the University of Denver and the University of Pittsburgh.

CARNEGIE-MELLON UNIVERSITY

Garlie A. Forehand

Professor and Chairman, Department of Psychology, Carnegie-Mellon University. Formerly Research Associate and Assistant Professor of Psychology, University of Chicago. Consultant to Educational Testing Service (1965), South Central Regional Educational Laboratory (1968), and Pittsburgh Board of Education (1965). *Publications*: "Assessments of Innovative Behavior: Partial Criteria for the Assessment of Executive Performance," *Journal of Applied Psychology*, 1963, *47*, 206-213; "The Role of the Evaluator in Curriculum Research," *Journal of Educational Measurement*, 1966, *3*, 199-204; *Individual Differences in Problem Solving Processes of College Students*, Cooperative Research Project No. 3151, U.S. Office of Education, Carnegie-Mellon University, 1967; "Functions of a Curriculum Evaluation System," *Teachers College Record* (in press). Ph.D., Psychology, University of Illinois, 1958. Dr. Forehand's interests are in psychological measurement, educational research, and cognitive processes.

TEACHERS COLLEGE - COLUMBIA UNIVERSITY

Francis A. J. Ianni

Professor of Education and Director, Division of Institutes and Programs; Chairman, Department of Education Administration; Director, Horace Mann-Lincoln Institute of School Experimentation. Previously Associate Commissioner of Education for Research. *Publications*: *American Social Legislation*, Harper, 1956, *Culture, System and Behavior*, Chicago, Science Research Associates, 1967. Ph.D., Anthropology, Pennsylvania State University, 1952.

Frank L. Smith, Jr.

Associate Professor of Education, Department of Educational Administration, and Director, Field Evaluation Unit, Horace Mann-Lincoln Institute. Previously Associate Principal, Ridgewood, New Jersey, High School. Author: (with Havighurst and Wilder), *Profile of Urban High School Schools* and (with Bellack, et. al.) *The Language of the Classroom*, Teachers College Press, Columbia University, 1966. Director of NASSP Study of High Schools in the Forty-Five Largest Cities. Consultant on the reorganization of secondary education through the development of local change advocates in several metropolitan districts. Ed.D., Secondary School Adminstration and Curriculum, Columbia University, 1963. Dr. Smith has a particular interest in classroom interaction systems.

PENNSYLVANIA STATE DEPARTMENT OF EDUCATION

Paul B. Campbell

Director, Office of Educational Research and Statistics, Pennsylvania Department of Education. Previously director of the Bureau of Educational Quality Assessment, Pennsylvania Department of Education; Coordinator of Instructional Research and Development Services, Livonia Public School System, Livonia, Michigan; and instructor in tests, measurement and evaluation, Eastern Michigan University Field Services. Author: "The Pennsylvania Plan," Section 1 of Phase II Findings, Burea of Educational Quality Assessment, July, 1970; and "School and Self-Concept," Educational Leadership, March 1967. Ed.D. in Evaluation and Research, Wayne State University, 1965. Major interests are educational goal definition, evaluation, and test construction.

Robert B. Hayes

Director, Bureau of Educational Research, Pennsylvania Department of Education; Member, Board of Directors, Appalachia Educational Laboratory. Author: Articles in Instructional Improvement Through Research, New York State Education Department and ERANYS, 1965; AV Communication Review, 1966; Journal of Teacher Education, 1963; Journal of Educational Research, 1963; The Reading Teacher, 1966, 1967, and 1969. D.Ed., Pennsylvania State University, 1961. His major interest is related to education management of applied research to improve teaching and learning.

ALLEGHENY COUNTY SCHOOLS

Fred C. Krause

Assistant County Superintendent in Charge of Research and Development, Allegheny County Schools; Director, Educational Development Center, Region D, Pennsylvania Department of Education. Ed.D. in Guidance and Psychology, University of Pittsburgh, 1955. Post-doctoral study in Elementary and Special Education at the University of Pittsburgh and Indiana University. Dr. Krause has held faculty positions at the University of Virginia.

AVONWORTH UNION SCHOOL DISTRICT

Robert F. Jordan

Supervising Principal, Avonworth School District. Previously Assistant Supervising Principal, North Hills School District. B.S., Indiana University, 1936. Mr. Jordan has actively participated, as a member and officer, in professional organizations on the local, county and state levels, and has taken roles in a variety of education workshops.

BALDWIN-WHITEHALL SCHOOL DISTRICT

J. Ernest Harrison

Superintendent, Baldwin-Whitehall School District. Previously Assistant Superintendent and Director of Curriculum and Research for the same district. Publications: Dissertation - "Achievement of Selected Types of Educational Objectives Through Use of Programed Materials." Co-Author - Program of Elementary Schience Education, Parco Scientific Inc., Warren, Ohio. D.Ed., University of Pittsburgh, 1964. Dr. Harrison's major interest is in the area of developing and implementing systems of instruction that take account of individual differences among students and the staffing problems which accompany such systems.

PHILADELPHIA SCHOOL DISTRICT

John B. Peper

Executive Director, Office of Research and Evaluation of The School District of Philadelphia. Previously Research Assistant at Temple University and Assistant Director of Upward Bound; U.S. naval officer and high school teacher. Publications in AERA; Elementary School Journal; Educational Service Bureau, Temple University; and Philadelphia Public Schools. Ed.D., Education Administration, Temple University, 1970.

PITTSBURGH BOARD OF PUBLIC INSTRUCTION

Merwin L. Himmler

Assistant Superintendent for Research and Development; formerly Associate Superintendent for Elementary Schools, Board of Public Education, Pittsburgh, Pennsylvania. Ed.E., Elementary Education, University of Pittsburgh, 1957.

WQED-TV

Rhea G. Sikes

Director, Department of School Services, WQED-TV. Chairman, Educational Programing Committee, Pennsylvania Public Television Network. Member, Instructional Television Standing Committee, Eastern Educational Television Network. Member, Instructional Television Committee, National Association of Educational Broadcasters. Author: "The Contributions of the Producer-Director in Improving Instruction: Summary Statement", Improvement of Teaching by Television, Griffith and MacLennon, Eds., Columbia, Mo., 1964. Editor: Teacher's Guide to Classroom Television, WQED-TV, Pittsburgh, Pa., annually 1959-1971. M.S. in Radio-Television, Syracuse University, 1954. Miss Sikes holds a wide range of consulting positions in public and educational television, and lectures in educational communications at the University of Pittsburgh.

Mary Sceiford

Assistant Director, Utilization and Development School Services, WQED-TV. Previously Classroom Teacher in Ohio and Wisconsin, Art Teacher, Grades 1-9, Mt. Lebanon School District, Pittsburgh, Pa. Author: Curriculum Guide for Art Education, Grades 1-6; Study Guide for Telecourse, WQED-TV; Dissertation: Instructional Television Producer-User Communications in New York State. Ph.D. in Instructional Technology, Syracuse University, 1969. Dr. Sceiford's primary interest is in the development, dissemination, and utilization of instructional television courses which will provide meaningful learning experiences.

AMERICAN INSTITUTES FOR RESEARCH

George L. Gropper

Principal Research Scientist and Director, Instructional Media Studies, The American Institutes for Research, Pittsburgh. Co-author: G.L. Gropper and J.G. Short, Design of a Training Development System, Pittsburgh: American Institutes for Research, 1968; G.L. Gropper and Z. Glasgow, Criteria for the Selection and Use of Visuals in Instruction, Pittsburgh: American Institutues for Research, 1969. Ph.D. in Industrial Psychology, University of Pittsburgh, 1956. Dr. Gropper's major work in research and development concerns contributions to and applications of instructional technology.

APPLIED SCIENCE ASSOCIATES

John D. Folley, Jr.

President and General Manager, Applied Science Associates, Valencia, Pennsylvania. Previously Program Director at the American Institutes for Research. Ph.D., Psychology, Carnegie Institute of Technology, 1961. Dr. Folley's work has emphasized task analysis and use of performance aids and job-oriented training to promote effective and efficient job performance. His background includes a degree in Mechanical Engineering from Stevens Institute of Technology.

Kenneth I. Rifkin

Associate Staff Scientist, Applied Science Associates. Previously a research associate in the Minuteman Program Office, Personnel Subsystem Section, Sylvania Electronics. Ph.D. in Experimental Psychology, Tufts University, 1967. Dr. Rifkin had conducted extensive research in the areas of visual perception, perceptual learning, and simulation training programs.

MCGRAW-HILL BOOK COMPANY

David Engler

Group Vice-President for Instructional Technology, McGraw-Hill Book Company. Formerly Director of Educational Systems Development and General Manager of the Instructional Systems Division of the same company. Taught for eight years in elementary, junior, and senior high schools. Publications: "Instructional Technology and the Curriculum," *Phi Delta Kappan*, 1970, *51*, 379-381; "Problems in Defining and Applying Technology to Education," *The Application of Techonology to Education*, Washington, D.C., American Society of Engineering Education, 1969. M.A., Teacher's College, Columbia University. Mr. Engler's interests concern the development of instructional systems and applications of technology to curriculum and instruction.

ED 080495

FINAL REPORT ON PROJECT TO DESIGN NEW PATTERNS FOR TRAINING R & D PERSONNEL IN EDUCATION (RFP 70-12)

PART IIC

SCOPE OF WORK

~~SP006~~
SP006 777

Learning Research and Development Center

University of Pittsburgh

December 18, 1970

CONTENTS

Page

1 . . . . . . Introduction

2 . . . . . . Program Development, Administration, and Evaluation, 2/1/71 - 1/31/72

3 . . . . . . Materials Development, 2/1/71 - 1/31/72

6 . . . . . . Training in Program 1: Short-Term Program to Train Professional Assistants to Develop Curriculum Materials, 7/1/71 - 12/31/71

6 . . . . . . Training in Program 2: Long-Term Program to Train Project Directors and Professional Assistants in Curriculum Development, 8/1/71 - 1/31/72

6 . . . . . . Training in Program 3: Short-Term Program to Train Project Directors to Design Local Instructional Change Programs, 7/1/71 - 1/31/72

7 . . . . . . Training in Program 4: Long-Term Program to Train Project Directors and Professional Assistants to Design and Conduct Local Change Programs, 8/1/71 - 1/31/72

SCOPE OF WORK

Introduction

The work of the operational phase divides into three closely related segments: program development, materials development, and training. During the first 12 months of the operational phase, February 1, 1971-January 31, 1972, all of the work will focus on the four training programs described in Part IIA of this report.

The period February through June of 1971 will be almost exclusively devoted to program development and materials development in preparation for launching training in all four programs in the summer or fall of that same year. The only activity directly related to training during those months will be that of recruiting trainees for the programs.

During the month of July 1971, it is planned to launch Programs 1 and 3 that, respectively, will offer short-term training in building curricular materials and in designing local educational change programs. These programs will be initiated with full-time institutes that begin with two-week sessions held during July and continue into the early fall with one or two more such sessions (each trainee receiving four to six weeks of such training). During the remainder of the fall, and until the end of the calendar year, training in these programs will continue with bi-weekly day-long workshops.

During the month of September 1971, it is planned to launch Programs 2 and 4 that, respectively, will offer long-term training (two or three full-time years in duration) in curriculum development or in the design and conduct of local change programs. During the ensuing 12 months, these programs will normally involve full-time study through course work, labs, and field observation. (Some trainees may spend a part of the year in internship settings.)

Program and materials development will continue throughout the initial 12-month grant period. Such development activities will be especially heavy for Programs 2 and 4 since the demands of these continuing, full-time programs for training materials will go far beyond what can be made ready at the time of their launching. Also, these long-term programs will continue to pose many demands for general development activities to devise and employ procedures for implementing, assessing, and revising program efforts.

The six-month period from February through July 1972 will see the continuation of Programs 2 and 4 and will involve a heavy commitment to program and materials development for two new major programs: Program 5 that will provide long-term training to develop training programs for educational personnel and Program 6 that will offer long-term training in the development of instructional environment systems. Also, this six-month period will involve revision and further development of Programs 1-4, employing formative-evaluation data from the first tryouts of these programs. Finally, this period will involve recruiting trainees for the four training programs to be activated in the second round, and for the two new programs to be launched in September 1972.

It should be noted that the six training programs still will involve training in just two major R & D areas, development and utilization (local change programs). The two new programs simply add specialties in two areas of development that already will be heavily involved in the training of curriculum developers. Many training tasks will be common to all of the four specialties in the development area.

It would be extremely hazardous to offer even tentative commitments as to the ways in which the work of the training Consortium will proceed during the last two years of the operational phase (September 1972 - August 1974) with respect to which training programs will be abandoned, continued, or added or with respect to whether efforts will be expended on refining and strengthening the training programs or on diffusing them. A definite expectation is that many components of the training programs will prove to be sound and transportable. A related expectation is that the effective diffusion of training units and segments, if not of entire programs, will be well under way before the end of the operational test.

Throughout the operational test, major efforts will be directed toward strengthening and extending the Consortium model as an agency of instructional innovation. Also, efforts will be made continually to recruit trainees from various sources, particularly trainees with extensive background training or work in fields outside education and trainees who represent different sub-populations.

The following sections set forth the work that will be performed in each of six areas corresponding to the break-out of the budget request into six distinct segments.

Program Development, Administration, and Evaluation, 2/1/71 - 1/31/72

The work in program development during the first 12-month grant period will fall into four closely related areas. These are outlined below.

A. Building detailed specifications and procedures for the four training programs to be introduced in the summer and fall of 1971. (Descriptions of these programs are given in Part IIA of this report.) The specifications must include a detailed plan for conducting training during the first year. This demands decisions (and their implementation) concerning specifically what is to be taught in each program, what instructional approaches will be employed, what instructional settings will be used, how individualized instruction will be employed, and how the programs will be administered. Detailed plans for implementing each of the four programs must be developed.

proposal

B. Building the program in Instructional Development within the School of Education at the University of Pittsburgh. The task is to build an inclusive instructional program that will provide basic training for any specialty in the development, diffusion, and utilization of instructional innovations. This requires working with faculty colleagues to set up the needed administrative structure for trainee admission, program planning, counseling and guidance, instruction, progress assessment, and the granting of credits, degrees, and certificates. In addition, effective working relationships must be built involving faculty from different departments of the University, as well as LRDC staff members.

C. Developing the project Consortium into a functioning agency in the conduct of the program development, materials production, and training activities. Ways must be worked out to enlist the active and continuing participation of Consortium agencies in training program development, materials development, trainee recruitment, instruction in the programs, and the placement of program graduates.

D. Building and using instruments and procedures for evaluating the development, implementation, and outcomes of the training programs. This calls for designing and using specific approaches to formative and summative evaluation of different aspects of the work and the products of the operational phase. Many of the evaluation functions that must be carried out are very expensive inasmuch as they involve behavioral observation and interviews as well as less time-demanding procedures. Necessarily, the evaluation functions will be intimately blended with program development to provide the needed formative evaluation. The preparation of project reports is one outgrowth of this evaluation function.

The activities described above will be the work of the project staff. They have been budgeted for just in excess of $107,000, almost all of which consists of staff salaries, fringe benefits, and indirect costs.

Materials Development, 2/1/71 - 1/31/72

Developing instructional materials for the training programs is an essential and separable aspect of program development. Since the training programs under development possess many novel features, the great bulk of the training materials required have not existed heretofore. The new training programs demand a wide variety of materials including programmed descriptive texts, extensive practice workbooks, laboratory case and simulation materials, syllabus materials for the theory seminars, a number of actual curricula or change programs for the analysis seminars, and materials to train the trainers for the programs. Each of the instructional units within the proposed programs must include most or all of these types.

Because of the content differences between the programs in curriculum development and those in local change, the materials development work will have two parallel work flows--one for each of the major content areas--coordinated through one office. The coordination is essential since there is significant overlap, particularly as regards Educational R & D Foundations, Evaluation, Project Management, and the general core-level or analysis materials for all task areas.

The resources available to the project for materials development from sources external to the project staff can be classified in four categories: existing training units (including units under development elsewhere), materials from Consortium member school systems, materials from Consortium member university departments, and materials from Consortium member development agencies. These are discussed in turn below.

Existing materials. A major task during the initial months of the operational phase, and continuing throughout the project, is the search for and analysis of extant training materials. (This process is discussed in Part I, pages 6-7 of this report). To this point, the work has involved locating, analyzing, cataloging, and cross-referencing the materials. What must follow is a process of adapting and interrelating the materials for use in the training programs. It is essential that this integrative process begin as soon as possible for it is through this process that the specific needs for original development of materials will be defined; when materials that meet our criteria cannot be found, they must be created.

The process of building training units from available materials will be facilitated by the cross-reference system of recording information. For each training task (or group of tasks), a single reference sheet indicates the extent and kind of coverage available in all source material on hand. For each document, another reference sheet indicates the tasks or training objectives covered by that document, and the extent and kind of coverage. The task sheets prescribe which sections, chapters, etc. to lift and collate, with adaptive editing, to form instructional units; the document sheets suggest possible chains of continuity across instructional units. The project staff thus can make optimum use of available materials, minimizing the need for the more time-consuming and costly original development activities.

Materials from Consortium member school systems. The survey process probably will uncover few materials that offer the extensive analysis and practice opportunities required for effective training. Therefore, a complementary search must be conducted that is aimed at developing a bank of "raw materials" for use in analysis seminars and labs. Toward this end, Consortium school systems can make a great contribution. Each is conducting, or has recently conducted, major innovative programs ranging from the installation of an individualized elementary curriculum in a small suburban school to the system-wide reorganization of administration in a large urban system. The voluminous materials generated during these programs constitute valuable case study data for the analysis seminars in local change; with restructuring, they can be used for in-basket and simulation exercises for labs. In another vein, the member school systems use a great variety of curricular packages. Such packages, described in detail with extensive examples, form a materials core for the analysis seminar in curriculum development. The availability of actual use data for such materials is an added advantage.

Materials from Consortium member university departments. Members of the several university departments connected with the Consortium (at the University of Pittsburgh, Carnegie-Mellon University, and Teachers College, Columbia University) can contribute a substantial body of training materials. First is the identification and sequencing of syllabus materials for the theory seminars. Second are materials for R & D Foundations, much of which will require original expository writing. Third, faculty members will open their courses to trainees in the programs.

Materials from Consortium member development agencies. Several Consortium member agencies have extensive professional experience in developing training materials, specifically, the American Institutes for Research, Applied Science Associates, Research for Better Schools, and LRDC. These agencies have indicated the willingness to develop sizeable portions of the necessary materials, usually on a sub-contractual basis. Their contributions will be especially important in the development of the programmed descriptive materials at the core levels, and the materials required for labs offering guided practice (P1 and P2 levels). Much of the materials can be gathered from past or current projects within the agencies. For example, in the workshops on revising curriculum materials, trainees can work on actual materials generated by the development agencies, with accompanying pilot-test data.

It will be the task of project staff members to conduct or coordinate the processes of materials gathering and adapting. Further, the project staff must do extensive work on a continuing basis to originate, test, and refine materials not available from external sources. It is not expected that, initially, the training materials placed in use in the training programs will be in the form of fully-developed and adequately packaged units that can be diffused generally. Rather, materials as well as instructional procedures must be continually evaluated and revised throughout the operational phase with the goal of arriving at materials and associated procedures that are effective, efficient, and in a packageable form.

Associated with the training materials that are located, adapted, or built by the staff or Consortium members, it is essential that achievement sub-tests of appropriate types be constructed. This is required for pre-testing trainees on training units and for post-testing them after training to determine whether they have mastered unit objectives.

The budgeted allocation for materials development during the first 12 months is just over $24,000. Better than two-thirds of this sum is for project staff. Nearly one-third has been set aside for materials development under purchase services contracts.

Training in Program 1: Short-Term Program to Train Professional Assistants to Develop Curriculum Materials, 7/1/71 - 12/31/71

Should be out?

It is planned to conduct the initial tryout of Program 1 with some 12 trainees beginning in July 1971 with a two-week full-time institute session, conducting one or two further sessions in the early fall, and continuing with five or six bi-weekly one-day workshops. The trainees will come from Consortium member agencies where they are, or are becoming, employed as professional assistants engaged in writing curriculum materials.

Program 1, and the general training process to be employed, are described in Part IIA of this report, pages 5-8.

The budget being submitted for support of this training calls for just over $11,000, divided almost equally between salaries for instructional staff and trainee support in the form of per diem expenses while attending the training institute or workshops held in Pittsburgh. Salaries and travel expenses will be paid by the trainees' employers.

Why not empl. pay per diem? — for all?

Same w/3.

Training in Program 2: Long-Term Program to Train Project Directors and Professional Assistants in Curriculum Development, 8/1/71 - 1/31/72

It is planned to initiate the tryout of Program 2 beginning in September 1971. (The initial group of trainees will remain in the program for two or three years. It is expected to begin training a second group in September 1972, etc.)

Program 2, and the training process to be employed, are described in Part IIA of this report, pages 9-24.

The budget being submitted provides for 6 trainees in the initial group. The total requested if $14,760. This is divided almost equally between trainee support and institutional allowances for costs of instruction. It should be noted that the sum requested is for the first half of the first training year; an equivalent sum is included in the budget projection for the period 2/1/72 to 7/31/72 (see the final table in the Budgets book).

Training in Program 3: Short-Term Program to Train Project Directors to Design Local Instructional Change Programs, 7/1/71 - 1/31/72

It is planned to conduct the initial tryouts of Program 3 with some 20 trainees beginning in July 1971 with a two-week full-time institute session held at Pittsburgh with one group of trainees. One group of about 12 trainees will consist of employees of the Pennsylvania State Education Department, intermediate education units, and school systems. The other group will consist of leaders of community-action groups in Pittsburgh who are concerned with innovations in instruction related to the concerns of their groups. Staggered two-week institute sessions with this group of trainees, and with a second group, will be conducted during the fall months until each group has had a total of six weeks of training in the institute setting. Following the institute, each group will return bi-weekly for approximately five one-day workshops.

Program 3, and the general conduct of instruction in this program, are described in Part IIA of this report, pages 25-34.

The budget submitted for support of Program 3 during the period covered is $16,524. The requested sum divides into approximately 60 per cent for instruction in the program and 40 per cent for trainee support in the form of per diem expenses while attending institutes or workshops. Such support is requested for only 12 of the expected 20 trainees. The remainder of the trainees will be local residents not requiring stipend support.

Training in Program 4: Long-Term Program to Train Project Directors and Professional Assistants to Design and Conduct Local Change Programs, (8/1/71-1/31/72)

It is planned to begin the initial tryout of Program 4 in September 1971. (The initial group of trainees, as is the case with Program 2, will remain in the program for two or three years. A second group will begin training the following September, etc.) The small number of trainees is due to the limited funds available to support trainees and to provide the intensive individualized instruction required to launch the program.

Program 4, and the conduct of instruction within the program, are described in Part IIA of this report, pages 35-49.

The budget submitted for support of Program 4 during the period covered is $14,760. This is the same figure as that in the budget for Program 2. As with Program 2, the sum requested is divided about equally between trainee support and institutional allowances for instruction. Once again, the sum requested is for the first half of the first training year and an equivalent sum is included in the budget projection for the period 2/1/72 - 7/31/72 to be found in the final table in the Budgets Book.

Title: FINAL REPORT ON PROJECT TO DESIGN NEW PATTERNS FOR TRAINING R & D PERSONNEL IN EDUCATION (RFP 70-12)

Applicant Organization: Learning Research and Development Center
University of Pittsburgh
Pittsburgh, Pennsylvania 15213

Initiator: Glen Heathers

Glen Heathers
Professor of Education, University of Pittsburgh
Research Associate, Learning Research and Development Center
(412) 683-8641, Ext. 63

Transmitted by: William W. Cooley

William W. Cooley
Co-Director
Learning Research and Development Center
University of Pittsburgh
(412) 683-8641, Ext. 70

Date Transmitted: 18 December 1970

Paul Solyan

Paul Solyan
Comptroller and Assistant Treasurer
University of Pittsburgh
Pittsburgh, Pennsylvania 15213

ED 080495

FINAL REPORT ON PROJECT TO DESIGN NEW PATTERNS FOR TRAINING R & D PERSONNEL IN EDUCATION (RFP 70-12)

PART IID

BUDGETS

Learning Research and Development Center

University of Pittsburgh

December 18, 1970

~~SP 006 781~~
SP 006 777

BUDGETS

Introduction

In order to accomplish the work described in this report, the resources set forth in the following budgets will be required.

The budget for the first year of the operational phase (2/1/71 - 1/31/72) is broken down into six (6) parts corresponding to the identification of task areas in Scope of Work. Three (3) primary types of activity are provided for: program development, materials development, and training in each of the four (4) programs. While separate budgets are submitted, it is important to recognize that the six (6) budgets constitute a single package, all of whose components interact. Accordingly, an individual project could not be accomplished if the others were not funded.

It should be noted that the four (4) training programs divide into two (2) concerned with curriculum development and two (2) concerned with local change programs in school systems. Also, within each of these two (2) types, a long-term and a short-term program will be offered.

The budget for Program Development, Administration and Evaluation provides mainly for the project staff that will conduct these activities during the project. The Materials Development budget provides salaries for staff members who will perform the bulk of the work in this area. The budget also provides for parts of materials development to be subcontracted. Funds for Programs 2 and 4, both long-term training programs, provide mainly trainee support and institutional allowances for trainees that will support instruction in the programs. On the other hand, the budgets for Programs 1 and 3, both short-term training programs, provide trainee support and salaries of an instructional staff in lieu of institutional support.

Two summary tables indicate total costs for training activities, and for program development, materials development, and training taken together.

The final table offers a projection of OE funds that will be needed over the full 42-month period of the operational test. The second column is a budget projection for the six-month period February to July, 1972. It will be noted that funds for program development remain at about the same level over the 42-month period, that materials development costs decline toward the end of the period, and that training costs increase toward the end of the operational phase.

PROGRAM DEVELOPMENT, ADMINISTRATION & EVALUATION

2/1/71 - 1/31/72

Salaries		
1 Director @ $24,000/yr.	$24,000	
2 Research Asso. @ $18,000/yr.	36,000	
2 Research Assts. @ $8,000/yr.	16,000	
2 Secretaries @ $5,000/yr.	10,000	
	$86,000	$ 86,000
Fringe Benefits		8,600
Supplies		2,400
Travel		1,500
Communication		600
Direct Cost		99,100
Indirect Cost (8% of Direct Cost)		7,928
TOTAL		$107,028

MATERIALS DEVELOPMENT BUDGET

2/1/71 - 1/31/72

Salaries		
1 Asso. Professor @ $18,000/yr.	$18,000	
1 Asst. Professor @ $14,000/yr.	14,000	
2 Research Assts. @ $8,000/yr.	16,000	
1 Secretary @ $5,000/yr.	5,000	
	$53,000	$53,000
Fringe Benefits (10% of Salaries)		5,300
Supplies		3,200
Travel		1,600
Purchase Services (Materials Production)		24,000
Direct Cost		87,100
Indirect Cost (8% of Direct Cost)		6,968
TOTAL		$94,068

PROGRAM 1

CURRICULUM DEVELOPMENT (ST) TRAINING BUDGET

2/1/71 - 1/31/72

Salaries		
Instructional Staff 2 @ $8,000/yr.	FTE .25	$ 4,500
Fringe Benefits		450
Trainee Support (Stipends)		
12 Trainees @ $450/six week period		5,400
Direct Cost		10,350
Indirect Cost (8% of Direct Cost)		828
TOTAL		$11,178

ST - Short Term

PROGRAM 2

CURRICULUM DEVELOPMENT (LT) TRAINING BUDGET

2/1/71 - 1/31/72

Trainee Support	
6 Stipends @ $200/month	$ 6,000
Dependency	
6 @ $500/yr. for .42 years	1,260
Travel	
6 trips at $200/trip	1,200
Institutional Allowance	
6 @ $2,500/yr. for .42 years	6,300
TOTAL	$14,760

LT - Long Term

PROGRAM 3

LOCAL CHANGE (ST) TRAINING BUDGET

2/1/71 - 1/31/72

Salaries		
Instructional Staff	FTE	
2 @ $18,000/yr	.50	$ 9,000
Fringe Benefits		900
Trainee Support (Stipends) [1]		
12 Trainees @ $450/six week period		5,400
Direct Cost		15,300
Indirect Cost (8% of Direct Cost)		1,224
TOTAL		$16,524

---

[1] 8 of the 20 trainees will be local residents and will not require stipend support

ST - Short Term

PROGRAM 4

LOCAL CHANGE (LT) TRAINING BUDGET

2/1/71 - 1/31/72

Trainee Support	
6 Stipends @ $200/month	$ 6,000
Dependency	
6 @ $500/yr. for .42 years	1,260
Travel	
6 trips at $200/trip	1,200
Institutional Allowance	
6 @ $2,500/yr. for .42 years	6,300
TOTAL	$14,760

LT - Long Term

TRAINING ACTIVITIES

Summary Training Costs

2/1/71 - 1/31/72

Program	
1. Curriculum Development ST Program	$11,178
2. Curriculum Development LT Program	14,760
3. Local Change ST Program	16,524
4. Local Change LT Program	14,760
TOTAL	$57,222

ST - Short Term

LT - Long Term

TOTAL TRAINING PROGRAM COSTS

2/1/71 - 1/31/72

Program Development, Administration & Evaluation	$107,028
Materials Development	94,068
Training Program 1 - Curriculum Development (ST)	11,178
Training Program 2 - Curriculum Development (LT)	14,760
Training Program 3 - Local Change (ST)	16,524
Training Program 4 - Local Change (LT)	14,760
TOTAL PROGRAM COST	$258,318

PROJECTED OFFICE OF EDUCATION FUNDS

2/1/71 - 1/31/74

Classification	2/1/71 to 1/31/72	2/1/72 to 7/31/72	8/1/72 to 7/31/73	8/1/73 to 7/31/74	TOTAL
Program Development, Administration & Eval.	107,028	60,000	120,000	140,000	427,028
Materials Development	94,068	44,000	80,000	40,000	258,068
Training Program	57,222	30,000	60,000	80,000	227,222
TOTAL	258,318	134,000	260,000	260,000	912,318

ED 080495

FINAL REPORT ON PROJECT TO DESIGN NEW PATTERNS FOR TRAINING R & D PERSONNEL IN EDUCATION (RFP 70-12)

APPENDIX A

LIST OF TASKS IN EDUCATIONAL R & D

Learning Research and Development Center

University of Pittsburgh

December 18, 1970

~~SP 006 785~~
SP 006 777

TABLE OF CONTENTS

Page

1 . . . . Introduction

1 . . . . Rationale for the Content and Organization of the Task List and Work Flows

4 . . . . Development: Curriculum or Training Programs

6 . . . . Development: Instructional Environment Systems

8 . . . . Diffusion: Field Testing

9 . . . . Diffusion: Demonstration

10 . . . . Diffusion: Dissemination

14 . . . . Utilization (Local Change Programs)

16 . . . . Evaluation: Formative

18 . . . . Evaluation: Summative

20 . . . . Evaluation: Test Development

22 . . . . Research

24 . . . . Educational R & D Foundations

25 . . . . Social/Personal Competencies

26 . . . . Project Management

LIST OF TASKS IN EDUCATIONAL R & D

Introduction

The following listing of educational R & D tasks is meant to specify the units for which training components will be made available to use in training programs. No trainee will be taught to perform all of these tasks. However, it is intended that all of the tasks will be involved in the training programs offered different categories of trainees.

The list is divided according to eight areas of tasks: Development, Diffusion, Utilization, Evaluation, Research, Educational R & D Foundations, Social/Personal Competencies, and Project Management.

The effort has been made to provide a comprehensive coverage of the essential activities involved in educational R & D of any type and as conducted in any sort of agency.

Building training components begins by listing the objectives (trainee behaviors) involved in each task. Achievement sub-tests will be built to assess mastery of the objectives of the task. Then learning materials will be prepared for the task. The learning materials may involve study guides, reading matter, programed lessons, laboratory simulation, or internship experiences.

Training programs for individuals will be built by selecting those training components that match the tasks the trainee is called upon to master.

Rationale for the Content and Organization of the Task List and Work Flows

The task list is constructed on the assumption that the central tasks in instructional innovation are to be found in the areas of development, diffusion and utilization of innovations, with the tasks in the remaining 5 areas (evaluation, research, R & D foundations, social/personal competencies, and project management) having importance insofar as they contribute to these three areas.

The area of Development has been divided into two interacting but separable work flows. The first covers the development of school curricula or of training programs for educational personnel (which also require the development of curricula). Since school curricula and training programs require appropriate instructional environments for their implementation, the work flow for Instructional Environment systems is referenced at the relevant steps in the work flow for Development: Curriculum or Training Programs.

The work flow for the instructional environment covers arrangements and procedures that link curricula (learning objectives, units, materials) with students. The instructional environment thus incorporates learning space and equipment, staffing, organization for instruction, teaching methods, reinforcement schedules, interpersonal relationships, etc. The instructional environment system should be explicitly designed in terms of the learning objectives of the curriculum it implements as well as in terms of the characteristics of the student populations it serves.

The two development work flows terminate with pilot testing and revision of the innovative product. At this point, assuming the product yields valuable outcomes, diffusion becomes relevant.

The area of product Diffusion has been divided into three sub-areas: Field Testing, Demonstration, and Dissemination. The purposes of field testing are to try out the product in a variety of school settings, adapt it as needed to the requirements of each type of setting, provide materials and procedures (including staff training) for implementing it in the various contexts, and assess its outcomes in each of the several types of settings.

If the field tests show the product to yield valuable outcomes in given types of schools, Demonstrations at selected sites become appropriate. Demonstrations exhibit the product's use in schools and can offer opportunites for staff members of other schools to gain direct experience with the product and its implementation through workshops or internships held in a demonstration school.

Dissemination consists of any means employed to communicate information about a product to potential users. The purpose should not be seen as that of selling the product but rather of providing potential users with valid and adequate bases for deciding whether or not to adopt the product, and bases also for setting about to implement and assess it in the local setting.

The task flow for Utilization takes account of innovations from the perspective of the consumer rather than the producer. Here the proper starting points are the needs of the local school system or school. Available innovative (or pre-existing) products are then examined as they relate to meeting the designated needs. Local change programs then are designed and conducted to implement the products selected in ways that take account of the unique combinations of factors that apply to particular local settings.

(An ambiguity in the development-diffusion-utilization categorization is that, in a general sense, the term "development" applies to all three categories. This is the case since one not only may develop innovative instructional products but also may develop diffusion strategies and programs, or develop local change programs. In the present categorization, the term development applies to the origination of innovations in instruction.)

The task list for Evaluation is divided into three parts: Formative Evaluation, Summative Evaluation, and Test Development. Both formative and summative evaluation are very frequently referenced in the work flows for development, diffusion, and utilization since they are involved in assessing the design, implementation, and outcomes of programs in those areas. Competencies in test development are vital in projects to develop curricula or training programs and so are referenced in the work flows for those areas.

The task flow for Research relates to the task areas of development, diffusion, and utilization at those points where basic or applied research studies can contribute to the design of instructional innovations. In conducting "strategic" research that is intended to provide a basis for instructional innovation, the researcher selects a research problem that has direct relevance to instruction. (The study of Educational R & D Foundations provides the trainee with general bases for selecting strategic research problems.)

The area of Social/Personal Competencies lists characteristics trainees should possess for effectiveness as workers and members of project teams in educational R & D agencies. It is not assumed that each item on the list will be treated as a training task since most of the competencies are very hard to establish by training. To a considerable extent, these characteristics will be sought in trainees at the time of selection. Thereafter, most of the relevant training will be provided by individualized guidance and counseling.

The task list for Project Management covers the competencies that are required of managers of R & D programs, projects, or sub-projects. They concern project planning, budgeting and contracting, project staff, supervising project activities, and maintaining communication about the project.

DEVELOPMENT

A. Curriculum or Training Programs

1. Identify curriculum and training need
2. Apply criteria of importance and feasibility in deciding whether to develop.[d]
3. Identify classes of terminal objectives that are of concern. For example:
    a. Specific knowledge
    b. Specific procedures
    c. General cognitive skills (e.g., problem solving, formulating questions)
    d. General social and personal skills (e.g., self-direction, cooperation)
4. Specify terminal objectives using appropriate "experts" as sources of information.

*5. Analyze terminal objectives to determine common components, learning difficulties, prerequisite relations, etc.

*6. Establish instructional sequences and units, including entering prerequisites for each.

7. Prepare tests or observation schedules for each objective and/or sequence.[d]

*8. Formulate instructional strategies taking into acount:
    a. Behavior and learning analyses of the objectives
    b. Instructional sequences available (people, media, etc.)
    c. Interaction of subject matter, general cognitive and social goals
    d. Motivational and other charactertistics of students

Can be performed simultaneously or in any order.

9. Prepare instructional materials including programed lessons, inquiry problems, simulation exercises, etc.

10. Test the instructional materials on a few members of the target population.

11. Interpret test data and revise.[a]

*12. Identify or design educational environment and management necessary for implementation of curriculum.[b]

*13. Prepare materials required for management--including manuals for teachers and other staff members.[b]

*14. Identify teacher behaviors necessary for implementing the curriculum.

*15. Prepare teacher training materials and/or conduct training programs.[c]

16. Design an evaluation program to assess implementation and outcomes.[d]

17. Arrange and conduct a pilot test under controlled conditions.

18. Interpret pilot test data.[d]

19. Revise curriculum.

20. Revise management system.[b]

21. Revise staff training system. [c,e]

22. Collect evaluation data and report on program charactertistics and effectiveness.

---

a. Steps 10 and 11 should be repeated until the materials meet an appropriate criterion of acceptability.

b. See work flow for Instructional Environment Systems.

c. The present sequence of curriculum development can be applied to the design of teacher training materials, beginning with Step 1. For a teacher training program, the "staff" to be trained is the supervisor, course instructor, or other program administrator.

d. See work flow for Evaluation.

e. Steps 16-21 should be repeated until an appropriate criterion of acceptability is met.

---

* Processes likely to generate research questions. For the activities involved, see work flow for Research.

B. Instructional Environment Systems

1. Identify potential instructional environment design need.

2. Apply criteria of importance and feasibility in deciding whether to develop.[a]

3. Identify classes of terminal objectives that are of concern. For example:

    a. Specific knowledge

    b. Specific procedures

    c. General cognitive skills (e.g., problem solving, formulating questions)

    d. General social and personal skills (e.g., self-direction, cooperation)

4. Analyze existing and new information to produce a description of:

    a. Objectives to be met by the new instructional environment

    b. Current constraints in terms of space, manpower, cost, etc.

*5. For each objective in 4a, specify the kinds of environment(s) that are required, or might be expected, to meet the objective. Describe these environments in terms of:

    a. Curriculum content characteristics

    b. Curriculum management characteristics

    c. Reinforcement (motivational) characteristics

    d. Social characteristics

    e. Organizational arrangements

*6. For each item in 5, specify alternate ways in which the requirement might be met, taking into account space, manpower, equipment, scheduling, personnel satisfaction, etc.

7. Compare alternative in 6 with constraints in 4b.

8. Select an approach (from 6) with minimum discrepancy.

9. Determine necessary new facilities, staff, etc, and determine whether they can be made available.

10. Prepare observation schedules or tests for assessing extent to which critical characteristics of the environment system are being implemented.[a]

11. Identify curriculum materials necessary for implementation of environment system.[b]

12. Prepare manuals and other materials for implementing the new system.

*13. Identify teacher behaviors necessary for implementation.

*14. Prepare staff training materials.[b]

15. Design an evaluation program to assess implementation and outcomes.[a]

16. Arrange and conduct a pilot test under controlled conditions.

17. Interpret pilot test data.[a]

18. Revise environment system.

19. Revise curriculum for implementing environment system.[b]

20. Revise staff training materials.[b,c]

21. Collect evaluation data and report on program characteristics and effectiveness.

---

a. See work flow for Evaluation.

b. See work flow for Curriculum and Training Programs.

c. Steps 16-20 should be repeated until a criterion of acceptability for the total system has been met.

---

* Processes likely to generate research questions. For the activities involved, see work flow for Research.

DIFFUSION

A. Field Testing

1. Select and describe the product that is to be field tested.

2. Specify purposes to be served by the field test.

3. Identify sub-populations of potential product users having common characteristics that might influence product effectiveness.

    a. Socio-economic class

    b. Cultural/ethnic/nationality characteristics of community

    c. School location factors (urban/suburban/rural)

    d. Previous experience of school staff with similar products

4. Analyze the sub-populations to identify modifications required in the product or specific requirements for implementing the product in different settings.

5. Design needed product modifications.

6. Create product modifications and try them on samples of the sub-populations.

*7. Design implementation procedures appropriate to the sub-populations and/or changes required in the user agencies to implement the product (organizational structure, staffing, uses of facilities, etc.).

8. Develop the implementation procedures and make the required changes in user agencies.
9. Develop a program for assessing product implementation and outcomes.[a]

10. Select a variety of settings for try-out of the product that represent the major sub-populations of potential users.

11. Secure cooperation of field test agencies representative of the sub-populations

12. Design and implement needed training programs for personnel in the field test agencies.[b]

13. Conduct the field test.

14. Employ field test data to modify the plan or its implementation.[a]

15. Repeat the field test as the same or different sites representing the selected sub-populations.

16. Collect, analyze, and report data on product implementation and outcomes in the various types of setting.[a]

17. Recommend modifications in the product to the developer or producer.

B. Demonstration

1. Select and describe the product to be demonstrated.

2. Identify sub-populations of potential users of the product and develop criteria for the types and locations of demonstrations.

3. Select appropriate sites for the demonstration, considering such factors as:

   a. Validity of sites, i.e., degree to which they are representative of potential user settings

   b. Anticipated effects of a successful demonstration on potential users' decisions about adopting the product

   c. Evidence of cooperation from personnel at the sites considered

   c. Associated costs in staff, materials, time, etc.

4. Plan liaison and logistical operations for demonstration.

5. Prepare implementation plan including provisions for training operational and administrative personnel.[b]

6. Design an assessment program to:[a]

   a. Measure the effectiveness of implementation of the product

   b. Measure outcomes from implementing the product

7. Make necessary contacts and agreements with individuals and agencies for securing demonstration sites.

8. Train operational and administrative personnel.[b]

9. Implement the demonstration.

10. Collect and analyze feedback data to identify needed modifications in the demonstration.[a]

11. Modify the demonstration plan as indicated by feedback data.

12. Repeat the demonstration at the same or different sites.

13. Analyze data on product effectiveness and communicate information concerning needed modification to the product's developer or producer.[a]

C. Dissemination

1. Identify the need for a dissemination effort relevant to a specific instructional system/element.[a]

    a. Define the user population

    b. Define the instructional system/element of concern

    c. Assess the extent of current use of the instructional system/element of concern

    d. Assess the extent of potential adoptions and use within the target population

    e. Describe and assess the potential effect of increased use of the system/element (e.g., improvement in instructional methodology)

2. Apply criteria of importance and feasibility in deciding whether to conduct the dissemination effort.[a]

    a. Assess the cost of the anticipated dissemination effort

    b. Assess the potential success of the anticipated dissemination effort (in terms of information content conveyed, number of anticipated adoptions, and net positive effect on instructional methodology)

    c. Decide whether or not to initiate development of a dissemination program

3. Define the specific objectives of the dissemination effort.

    a. Identify classes of information the target audience should acquire as a result of the dissemination effort

        (1) Characteristics of the instructional system/element

        (2) Potential educational benefits of the system/element

        (3) How the product differs from other products of the same type

        (4) How to adopt and use the product

        (5) Logistical, administrative, and cost factors involved in the system/element's use

    b. Identify extent of target audience to be reached

    c. Identify time, cost, personnel limitations relevant to the anticipated dissemination effort

4. Identify the target population in terms of characteristics that will be relevant to designing and administering the dissemination effort.[a]

    a. Devise a system for the collection of information describing the target population such as:

        (1) Entering behavior with respect to objectives specified in 3 above

        (2) Anticipated resistance and/or interest in the system/element

        (3) Geographic location and degree of dispersion of the target group

        (4) Accessibility through prospective media (e.g., print, face-to-face contact, direct mail, etc.)

        (5) Degree of homogeneity/heterogeneity in the above descriptive factors

    b. Identify reliable sources of valid descriptive data (factual, judgmental)

    c. Collect the descriptive data

    d. Analyze and interpret the data

    e. Describe the target audience in terms of the data acquired

*5. Formulate a strategy for the dissemination effort, integrating information about the target population, product characteristics, communication channels, and vehicles.

    a. Identify the major elements of the dissemination effort whose goal is to maximize achievement of the dissemination objectives at a minimal cost

        (1) Select appropriate media

        (2) Conceptualize an appropriate message (i.e., information content, level of detail)

        (3) Define an information dissemination schedule (how, when, and where contacts will be made)

    b. Predict the general effect of the above elements

    c. Modify the elements as required

6. Develop the dissemination material.

    a. Write, edit and revise copy

    b. Prepare illustrations

7. Develop instruments and procedures for evaluating the dissemination effort in terms of effectiveness of implementation and accomplishment of objectives.[a]

    a. Develop a measurement system (e.g., descriptive dimensions, measurement instruments, etc.)

    b. Establish criteria and standards of evaluation

    c. Develop data collection and analysis procedures

    d. Develop data interpretation and feedback procedures

8. Pretest the prototype material on a small sample of the target population.[a]

    a. Locate and contact a representative sample of the target population

    b. Administer material

    c. Utilize measurement system (collect, analyze, and interpret data measuring the effect of the pilot dissemination effort)

    d. Recommend modifications to the dissemination system based upon pretest results

9. Revise the material on the basis of tryout results.[a]

    a. Determine areas of dissemination effort where improvements appear to be required

    b. Determine type and extent of improvements required

    c. Assess cost and degree of improvement resulting from suggested modifications

    d. Make improvements which are cost/effective

10. Implement the dissemination program with the target population.

    a. Manage preparation and dissemination of finalized materials

    b. Make last-minute alterations in materials, methods, etc., which are required

    c. Implement dissemination evaluation procedures

    d. Respond to audience questions, adoption requests, criticisms, etc.

11. Assess the effectiveness of the dissemination program in terms of:[a]

    a. Number of potential users reached

    b. Knowledge potential users gained about the product in terms of the objectives listed

    c. Evidence that the dissemination effort has influenced valid decisions to adopt or not to adopt the product

    d. Cost benefit analysis

12. Revise the program in the light of evaluation results and repeat steps 10-11.

13. Prepare report on the dissemination effort including recommendations to producers and marketers.

---

[a] See work flow for Evaluation.

[b] See work flow for Development: Curriculum or Training Programs.

---

* Processes likely to generate research questions. For the activities involved, see work flow for Research.

UTILIZATION (LOCAL CHANGE PROGRAMS)

1. Identify and define the objectives of the instructional system/sub-system/ elements of concern.

2. Assess the degree to which the designated objectives are currently being achieved and identify the critical areas of shortcoming.[a]

3. Identify and assess the means (methods, products, services) available within the state of the art that could be used to remedy the identified shortcomings.[a]

*4. Develop a list of change programs that might be undertaken to remedy the shortcomings identified.

5. Assess the short and long term costs associated with the available means for improving the accomplishment of the designated objectives.[a]

*6. Conduct a local resources survey to identify constraints associated with undertaking change programs intended to remove designated shortcomings.[a]

7. Rank order the potential change programs in terms of such dimensions as:[a]

    a. Relative need for the changes involved

    b. Likelihood of program effectiveness

    c. Anticipated impact of the program on other components of the instructional system

    d. Difficulty of implementing the program

    e. Availability of needed resources for program implementation

    f. Support for the program within school and community

8. Select the change program to be undertaken.

9. Design the change program, specifying:

    a. Changes to be instituted in the instructional program

    b. Required changes in administrative/management producedures

    c. Support and service requirements

    d. Training required

    e. Program implementation procedures

10. Design a program for assessing program implementation and effectiveness.[a]

11. Obtain the resources required to conduct the change program from internal and/or external sources (approval, experitise, funds, etc.).

12. Conduct pre-implementation activities:

    a. Preparation of materials, etc.

    b. Modifications in instructional arrangements

    c. Training of personnel

13. Implement the change program.

14. Collect and analyze feedback data, modifying the change program as indicated.

15. Implement the modified program, gatheing assessment data on implementation and outcomes.

16. Analyze data on program effectiveness and prepare a report with recommendations for continuing, extending, or abandoning the change program.

---

a. See work flow for Evaluation.

---

* Processes likely to generate research questions. For the activities involved, see work flow for research.

EVALUATION

I. Formative

   A. Evaluate relevant context to identify major problem areas.

      1. Identify present goals of system

      2. Assess value of goals

      3. Identify criteria and data to be used in assessing goal achievement

      4. Assess current degree of goal achievement

      5. Identify problem area(s) to be the focus of immediate attention

   B. Evaluate inputs (goals and plans for their achievement).

      6. Identify and clarify basic purposes of the given development effort in terms of:

         a. Clarity of statement

         b. Feasibility

         c. Potential value as solution to problems identified

      7. Delineate specific goals and evaluate them in terms of:

         a. Relationship to basic purposes

         b. Specificity of their statement

         c. Possibility of attainment

      8. Specify criteria to be used in eventual assessment of specific goals and evaluate them in terms of:

         a. Validity (including potential reliability)

         b. Feasibility

      9. Examine plans for achieving goals and evaluate them in terms of:

         a. Actual availability (Have plans been produced?)

         b. Specificity and clarity

         c. Potential for achieving goals (Are they based on any relevant research or on results from experience?)

         d. Usefulness (Can they be carried out?)

C. Evaluate processes (i.e., program operation).

10. Assess degree of implementation of plans

    a. Develop procedures and techniques for monitoring extent of implementation

    b. Apply procedures and modify them as needed

    c. Carry out the monitoring activities

    d. Channel feedback on operations to proper persons or agencies

    e. Clarify the implications of specific types of feedback

11. Further monitor program implementation as initial feedback results in change

12. Monitor restructuring of plans as this is indicated by feedback on operation

D. Evaluate products (i.e., assess achievement of program goals).

13. Apply criteria and procedures for determining degree of achievement of goals

    a. At various stages of implementation to provide interim summative evaluation data

    b. When development effort is completed (See Summative Evaluation)

14. Prepare evaluation reports.

    a. At intermediate stages

    b. As final summative assessment

II. Summative

1. Specify the characteristics of the instructional system/sub-system/element to be evaluated (see Formative Evaluation).
2. Specify the purpose(s) of the evaluation effort and the uses to be made of the findings.
3. Identify the dimensions of the system/element characteristics(s) to be evaluated; for example:
    a. Effectiveness in attaining objectives
    b. Acceptability to users
    c. Compatibility with operational context
4. Describe alternative means of data collection for each dimension of concern (for example, rational examination, observation, measurement).
5. Identify and consider the variables that influence the selection of a data collection method.
    a. Availability of useful criteria and minimum standards
    b. Reliability and validity considerations
    c. Associated costs and time factors
    d. Availability of instruments or procedures
    e. Administrative resistance
6. Select an appropriate data collection approach.
7. Develop a procedure for analyzing, interpreting, and communicating evaluative data, findings, and recommendations.
    a. Acceptable criterion levels for dimensions of concern
    b. Diagnostic/analytic techniques
    c. Statistical operations
    d. Operations for converting findings into useful form
8. Identify constraints, costs, technical limitations of procedure.
9. Modify procedure in light of constraints, costs, and limitations identified

10. Plan evaluation study activities.
    a. Staffing
    b. Staff training
    c. Liaison and logistical activities
    d. Work schedule
11. Carry out and coordinate required pre-study activities as in 10 above.
12. Conduct evaluative data collection as identified in 4 above.
13. Analyze data by procedures developed in 7 above.
14. Interpret findings and transform them into a format which satisfies the needs of the evaluation effort.
15. Report findings and make specific recommendations re continuing, modifying, or terminating the instructional system/sub-system/element under consideration.

III. Test Development

1. Define purpose and use of test.
2. Prepare content and behavioral specifications of test.
    - a. Analyze behaviors or construct to be tested to determine components
    - b. Select general classes of content and behavior to be included on test
    - c. Determine relative emphasis for general classes of content and behavior to be included on test
3. Survey practical limitations for test use and administration and develop tentative plan for final integration of test into overall testing program.
4. Develop scoring procedures.
5. Determine ultimate test length and length of tryout versions.
6. Plan for item construction (number and types of items required) in terms of personnel and resources.
7. Develop test items, directions to examinees, directions for administering and scoring procedures.
    - a. Construct preliminary versions
    - b. Edit and review
    - c. Prepare records for each item
    - d. Revise items, directions, and scoring procedures on basis of review
8. Plan tryout stages.
    - a. Develop sampling plan
    - b. Make administrative arrangements
9. Tryout test and alternate forms.
10. Analyze data to determine:
    - a. Any mechanical difficulties in test taking and administration
    - b. Actual time requirements
    - c. Reliability and validity of tests
    - d. Difficulty and/or discriminations of items

11. Recycle if data in Task 9 indicates need.

12. Plan for and conduct equating and standardization studies if necessary.

13. Design and reproduce final version of test (includes page size and layout, provisions for directions, and provisions for responses).

14. Prepare technical report and test interpretation manual.

RESEARCH

1. Select the research topic or area of interest and indicate the basic variables to be investigated.

2. Locate, review, and critique previous theory and research related to the topic or area.

3. Identify the situational factors that will limit the research activity (available personnel, facilities, time, etc.).

4. Specify the research problem in terms of independent and dependent variables.

5. Predict the functional relationships between independent and dependent variables.

6. Plan a research approach suitable to the problem, considering dimensions such as:

    a. Data collection methodology

    b. Statistical design

    c. Number of observations and/or subjects required

    d. Logistical, technical, and cost limitations

7. Assess the feasibility of the initial plan and modify it accordingly.

8. Define the independent and dependent variables in terms of the operations and measures to be used in the research environment.

9. Identify the subject population.

10. Specify the research design in terms of:

    a. Characteristics of data to be acquired

    b. Data collection environment, procedures, and schedules

    c. Control techniques (e.g., statistical, experimental, sampling)

    d. Anticipated data analysis procedures

    e. Anticipated personnel, time, funding, facilities, materials, and liaison requirements.

11. Modify research design in light of reality constraints.

12. Plan to implement research design.
    a. Hiring and/or training research personnel
    b. Liaison and logistical activites
    c. Design and construction of required data collection instruments, methods, devices
    d. Specify pre-study activities (e.g., pre-testing methods and materials)
    e. Set up milestone chart for completion of research activities
    f. Provide for use of alternative research approaches if problems are encountered
13. Conduct pre-research activities.
    a. Train personnel
    b. Confirm operability, reliability, and validity of data collection instruments and procedures
    c. Conduct liaison and logistical activites
    d. Revise research design and plan as required
14. Implement research plan.
15. Monitor research operations for anticipated difficulties.
16. Make changes in research design, in data collection procedures, or in technical or administrative operations as required to overcome difficulties encountered.
17. Complete data collection using original or revised plan.
18. Transfer raw data into appropriate form for further processing.
19. Implement statistical methods of data analysis.
20. Depict findings with graphs, tables, and other appropriate presentations.
21. Summarize, interpret, and report findings in a form appropriate to the intended audiences, including specialists in instructional development, diffusion, or utilization.

EDUCATIONAL R & D FOUNDATIONS

1. Define, distinguish, and interrelate educational development, diffusion, utilization, evaluation, and research.

2. Describe functions, programs, and roles in these educational R & D agencies: research-and-development centers, regional educational laboratories, state education departments, supplementary education centers, research-and-evaluation centers in school systems, and members of the education industry.

3. Demonstrate competence in search skills required in locating information about educational R & D.

4. Describe the "educational reform movement" in the United States during the period since 1955 in terms of major purposes underlying innovative programs, origins of major program thrusts, sources of funding, types of innovations brought forward, and impact on instruction in schools.

5. Describe instructional systems in terms of their major components.

6. Compare and contrast two or more instructional systems in terms of how they represent each major component.

7. Specify the requirements for building a programed instructional unit.

8. Specify the requirements for instructional programs that represent each of the following related themes: individualization, mastery, and student self-direction.

9. Compare and contrast two or more instructional systems in terms of how and to what degree they involve individualization, mastery, and student self-direction.

10. Specify the instructional requirements for teaching inquiry (problem-solving thinking or creative production).

11. Compare and contrast two or more curricula in terms of how and to what extent they are designed to teach inquiry; ditto for two or more instructional approaches.

12. Describe school/community relationships as they impact on the design, conduct, and support of the instructional program; give particular attention to issues concerning Black/White relations in the inner city.

13. State learning objectives of the following types in terms of student behaviors: reading, arithmetic skills, concepts, principles, problem-solving competencies, competencies in self-directed learning, competencies in self-evaluation, positive self-concept, and values.

14. Demonstrate knowledge of learning theory (concept and principle learning; discrimination and generalization or transfer; motivation and reinforcement) in relation to instruction.

15. Demonstrate knowledge of the relationships of basic (fundamental) and applied research to the design of instruction.

SOCIAL/PERSONAL COMPETENCIES

A. Interpersonal

1. Express information and ideas effectively to co-workers at appropriate times.
2. Request needed information or help from co-workers.
3. Assist co-workers and accept assistance from them.
4. Contribute ideas to group planning activities.
5. Assess one's competencies related to the group's work, and communicate these to the appropriate group members.
6. Accept and perform differing roles in group according to work requirements.
7. Contribute to maintenance of group's work flow.
8. Contribute evaluation of group performance and offer suggestions for improvement.
9. Contribute to positive interaction among group members.

B. Work Habits/Attitudes

10. Perform and complete work on schedule.
11. Accept and assume responsibility for own work.
12. Work independently.
13. Subordinate personal interests to work requirements.
    a. Changes in job status when necessary
    b. Work schedules
    c. Regulations and supervision
14. Maintain professional ethics in work activities.
15. Show interest in work.
    a. Improving technical knowledge of proficiency
    b. Participation in professional organizations

PROJECT MANAGEMENT

A. Planning the Project

1. State project objectives as products and processes.
2. Select a planning technique appropriate to the scope and goals of the project.
3. Diagram the flow of activities in PERT form.
4. Analyze work to estimate requirements for:
    - a. Staff competencies
    - b. Funding
    - c. Time
    - d. Facilities
5. Define alternate sets of staff roles, and their related tables of organization.
6. Identify and plan needed inter-actions with other projects and agencies.
7. Prepare project plans which specify the inter-relations of elements 4 a-d above, establishing intermediate and final deadlines.
8. Establish planning feedback mechanism.
9. Periodically assess work flow, budget, assignments, etc., to determine if the plan is working.
10. Revise plan or components as necessary.

B. Budgeting and Contracting

11. Identify funding sources.
12. Estimate direct/indirect project costs.
13. Analyze project organization/funding for compliance to relevant guidelines.
14. Prepare detailed budget.
15. Select a budgetary cost control system.
16. Prepare formal contracts with funding agencies and subcontractors.
17. Procure necessary facilties, equipment and support services.

C. Building Manpower Resources

18. Recruit and select staff to achieve a full set of staff roles as identified in 5 above.

19. Orient staff to the project in terms of project goals, demands on staff, table of organization, project setting, personnel policies, etc.

20. Assess staff members to determine training needs at the outset and as they develop.

21. Select or design training experiences.

22. Conduct formal/informal training for staff members as needed.

23. Build working relations (contractual/informal) with necessary projects and agencies as identified in 6 above.

D. Supervising Project Activites

24. Make assignments appropriate to staff members' capabilities/interests.

25. Delegate authority commensurate with responsibility/capability.

26. Specify and maintain standards of quality/efficiency.

27. Parcel work, with full specifications, to other projects and agencies.

28. Adjust assignments to correct excessive/insufficient work loads.

29. Provide appropriate reinforcement.

30. Maintain accountability mechanism for expenditures and staff time.

E. Communicating Information

31. Develop formal communication network within project and agency.

32. Periodically report progress and accountability to administrators and funding agencies when necessary.

33. Keep staff fully informed of decisions and their rationale.

34. Develop effective liaison with groups/individuals interested in project goals and progress.

ED 080495

LEARNING RESEARCH & DEVELOPMENT CENTER

UNIVERSITY OF PITTSBURGH

APPENDIX B

OF

FINAL REPORT ON PROJECT TO DESIGN NEW PATTERNS FOR TRAINING RDDE PERSONNEL IN EDUCATION (RFP-70-12)

December 18, 1970

~~SP 006 783~~
SP 006 777

CONTENTS

Section A. A Behavioral Analysis of the Curriculum Development Process

Section B. An Instructional Strategy to Guide the Development of an Educational R&D Curriculum

SECTION A

A BEHAVIORAL ANALYSIS OF THE CURRICULUM DEVELOPMENT PROCESS

A WORKING PAPER

BEHAVIORAL ANALYSIS* OF PROCEDURES IN CURRICULUM DEVELOPMENT

A Diagrammed Representation

George L. Gropper and Lauren B. Resnick
American Institutes for Research
University of Pittsburgh

26 October 1970

INTRODUCTION

The following pages present in diagrammatic form a preliminary, partial, and illustrative analysis of tasks involved in developing and diffusing a curriculum. The purpose of this analysis is to identify the skills which are involved in the curriculum development process and which personnel who are to participate in the process must acquire.

The particular type of analysis which was applied to the development process and that is here represented diagrammatically is called "behavioral analysis." This type of analysis requires the identification of discriminations, generalizations, and chains, three skills thought to be present in all types of performance. These skills are involved in varying combinations and to varying degrees in such diverse types of behaviors as: perceptual-motor performance, language, decision-making, following procedures, use of concepts and principles, etc. Because all these differing types of behavior can be analyzed for just three skills and for the same three skills, the ability to perform a behavioral analysis constitutes an ability generalizable to a broad range of performance tasks and knowledge domains. Because of this broad applicability, behavioral analysis represents a tool that can be used economically in dealing with the range of problems likely to occur in training and in education.

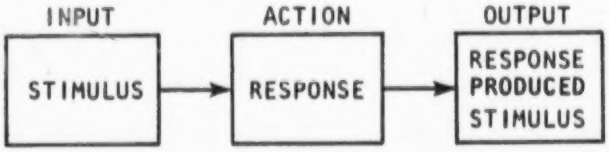
The techniques of behavior analysis have other advantages when used in developing curricula or in developing training programs. Once criterion performance, as stated in training or education objectives, have been analyzed behaviorally for the three component skills (discriminations, generalizations, or chains), many of the decisions about training or about education follow directly. One such key.decision is to provide the learner the opportunity to practice these very skills involved in the terminal performance. Having already identified the skills involved, decisions about training or education follow directly without the need for highly subjective and inferential leaps.

The program being designed to train R, D, D, and E personnel will include instruction in the application of behavior analysis techniques to the development of curricula. In this project, the project staff itself is applying the very same techniques in analyzing procedures involved in developing a curriculum for R, D, D, and E personnel. Thus, the project staff will therefore be recommending to R, D, D, and E personnel, "Do as we do."

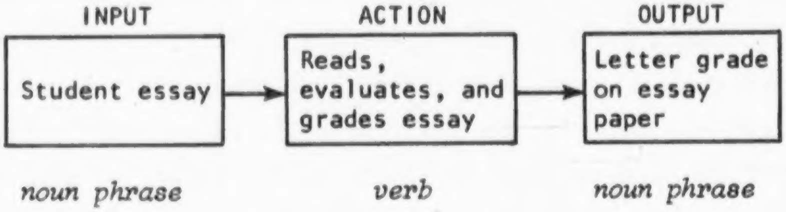
EXPLANATION OF DIAGRAMMATIC CONVENTIONS

There is recent evidence suggesting that diagrammatic representations make learning more effective and efficient.* There is every reason to suppose that if diagramming can be used as a *learning aid*, it can also be used as a *performance aid*. And, indeed, one programmed course on instructional technology has used diagramming techniques to facilitate the learning (and performance) of behavioral analysis techniques.** Similar diagrams are used in this report. An explanation of some of the diagramming conventions follows.

All types of diagrams identify what are called inputs, actions, and outputs.


INPUT
ACTION
OUTPUT
STIMULUS
RESPONSE
RESPONSE PRODUCED STIMULUS

"Inputs" and "outputs" are used to refer to what psychologists call stimuli or stimulus situations. "Actions" refer to responses. The difference between input and output consists primarily in "outputs" being stimulus conditions *produced by* the response a person has made. Inputs are an initial set of conditions that become the occasion for a response yet to be made. The diagram that follows illustrates a bit of a teacher's behavior.


INPUT
ACTION
OUTPUT
Student essay
Reads, evaluates, and grades essay
Letter grade on essay paper
noun phrase
verb
noun phrase

---

*Gropper, G. L. The design of stimulus materials in response-oriented programs. Audio-Visual Communication Review, 1970, 18 (2), 129-159.

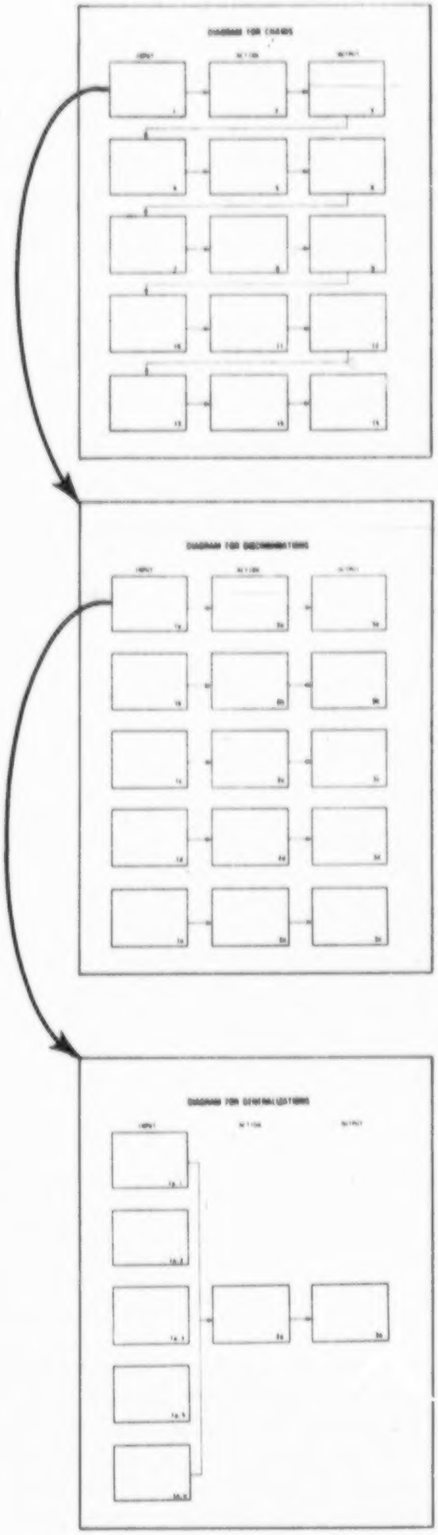
Horn, R. E., Nicol, E. H., Kleinman, J. C., & Grace, M. G. Information mapping for learning and reference. Cambridge, Mass.: Information Resources, Inc., 1969.

**Gropper, G. L., & Short, J. G. Design of a training development system: A handbook. Pittsburgh: American Institutes for Research, 1969.

"Inputs," always expressed as a noun phrase, consist of a set of conditions (physical or psychological) which become the occasion for an action to be taken. "Actions," always expressed as a verb, consist of the behaviors or responses exhibited. "Outputs," always expressed as a noun phrase, consist of a set of conditions (physical or psychological) produced by the action taken.

Diagrams consisting of spatially ordered rectangles can be used to represent inputs, actions, and outputs involved in all three skills: discriminations, generalizations, and chains. Discriminations, generalizations, and chains, however, are each uniquely represented by different types of diagrams.* The differences are illustrated on the following page.

**The potential uses of diagrams do not stop with their use in aiding the curriculum developer to analyze his subject matter and to develop strategies for teaching it. The diagrams themselves can also be presented to the student or trainee to aid his acquisition, retention, and transfer of the skills involved in terminal performance. Thus, for example, the diagrams presented in this volume can be considered as a job aid for the project staff in designing a curriculum for R, D, D, and E personnel. In the actual presentation of the curriculum to R, D, D, and E trainees, the very same diagrams can be used by the trainees as a learning aid.*



Most types of performance involve a large number of sequentially ordered sets of INPUT-ACTION-OUTPUT relationships. The diagram at the right illustrates, through the use of long, connecting arrows, how an output becomes the input for the next action in the chain. For example, the output in square #3 becomes input #4 for the next part of the chain.

At any point in a chain, the performer has to be able to identify alternative input conditions. He has to identify an input from one of several possible inputs in order to be able to take alternative courses of action. Thus, a driver has to discriminate between red and green traffic lights (the alternative inputs) if he is to properly stop the car or to continue driving. Each input cell can be broken down, as in the diagram to the right, into alternative input conditions, la, lb, etc., which the performer has to differentiate or discriminate.

Sometimes when there are alternative input conditions to be discriminated or differentiated, each alternative may consist of a class of input conditions which have to be treated the same way. For example, the teacher has to discriminate between the classes, "boys" and "girls" (e.g., in order to make sure they use the proper toilet facilities). She also has to generalize (i.e., identify all boys as boys and all girls as girls, which may be more difficult these days due to adoption of similar clothing and hair styles). In the diagram to the right, cell la in the above diagram is broken down into varied members belonging to the same class.

The following pages contain a diagrammed overview of the development process (represented as a summary procedural chain) and some illustrative breakdowns showing an identification of more detail in the chains and an identification of the component discriminations and generalizations.

This type of analysis will be completed for the entire curriculum development process and will form the basis for the design of procedures for providing training in curriculum development. The same type of analysis, although completed in less detail during the design phase, will be applied to other R, D, D, and E functions.

CONTENTS

page

SUMMARY DIAGRAM FOR PROCEDURAL CHAIN 1

DETAILED ANALYSIS FOR EACH STEP IN CHAIN

Step 1 Identifying Potential Curriculum Development Need 5

Step 2 Making Decisions Whether to Develop Curriculum 7

Step 3 Making Decisions About General Classes of Terminal Performance 9

Step 4 Identifying Information Needed for Specifying Terminal Performance 13

Step 5 Collecting and Transforming Information into Task Descriptions and Specification of Objectives 31

Step 6 Performing Behavioral Analysis of Tasks 57

Step 7 Identifying More Detailed Prerequisite Behaviors 71

Step 8 Performing a Learning Analysis 79

Step 9 Deciding How to Group and Sequence Learning Tasks 89

Step 10 Developing Criterion Performance Tests 101

↕ either order

Step 11 Formulating Instructional Strategies 117

Step 12 Preparing Instructional Materials and Procedures 177

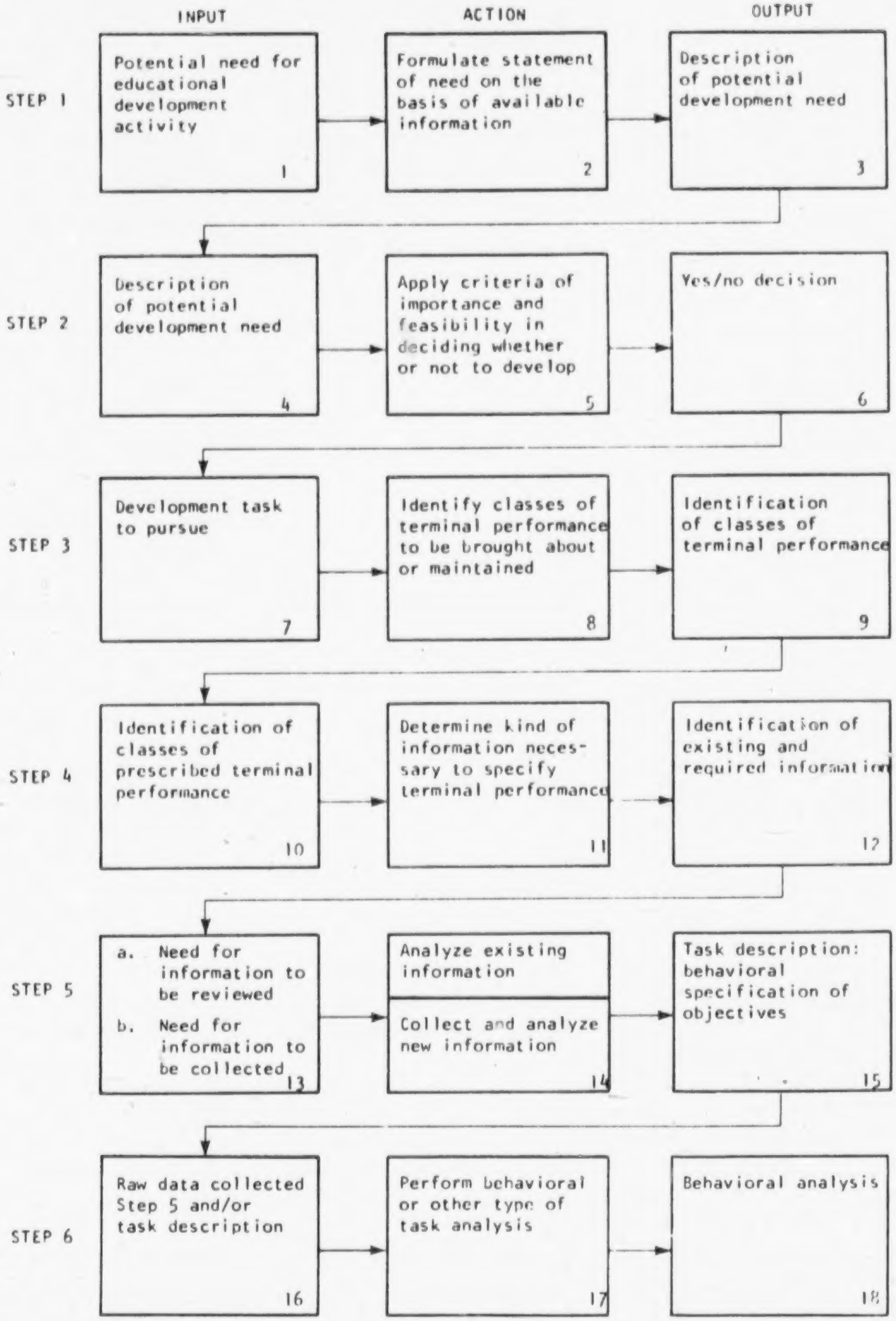
Step 13 Conducting Informal Tryouts 189

Step 14 Interpreting Tryout Results and Making Revisions 191

Step 15 Planning Classroom Testing 203

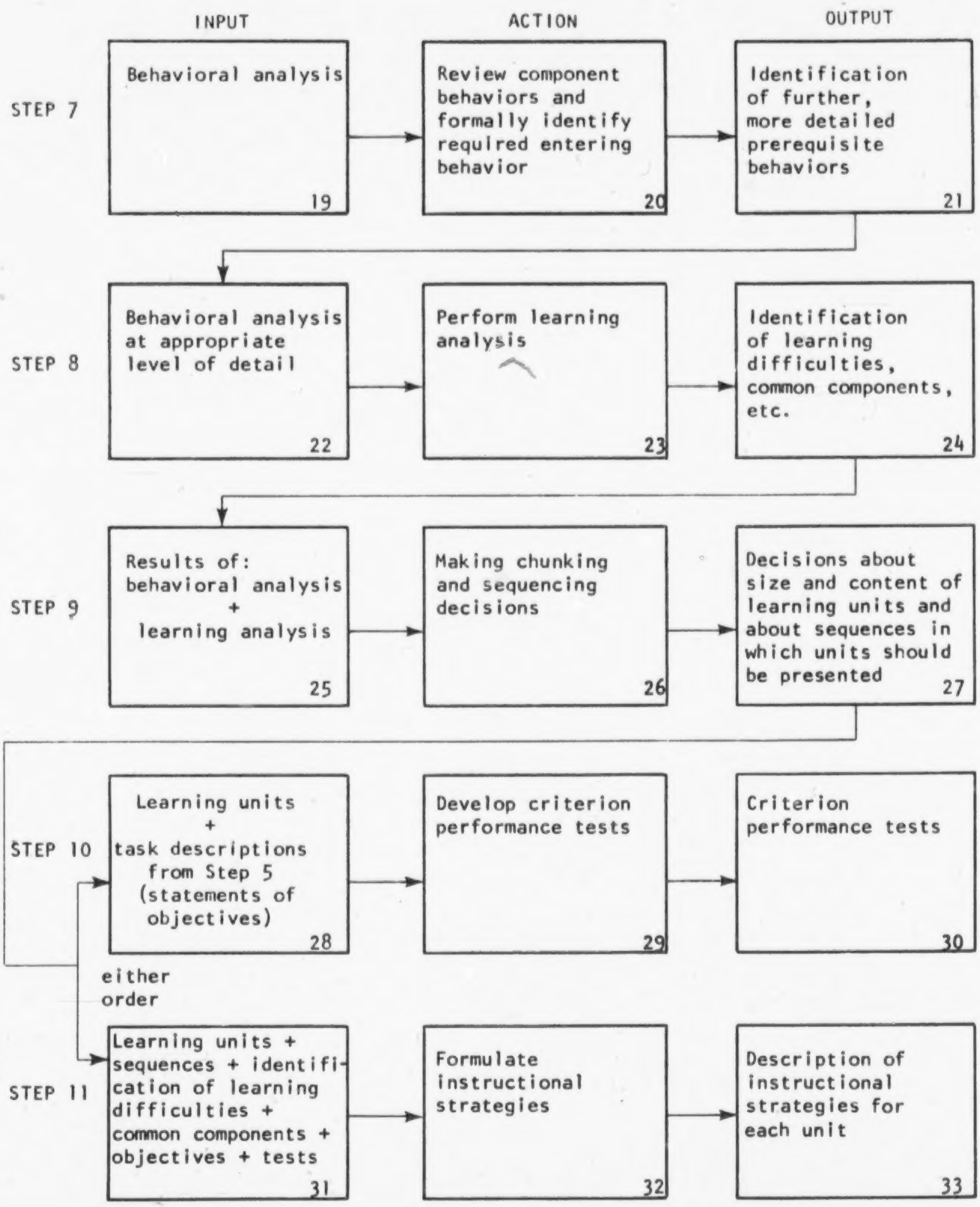
Step 16 Implementing Classroom Testing 205

SUMMARY DIAGRAM
FOR ENTIRE PROCEDURAL CHAIN

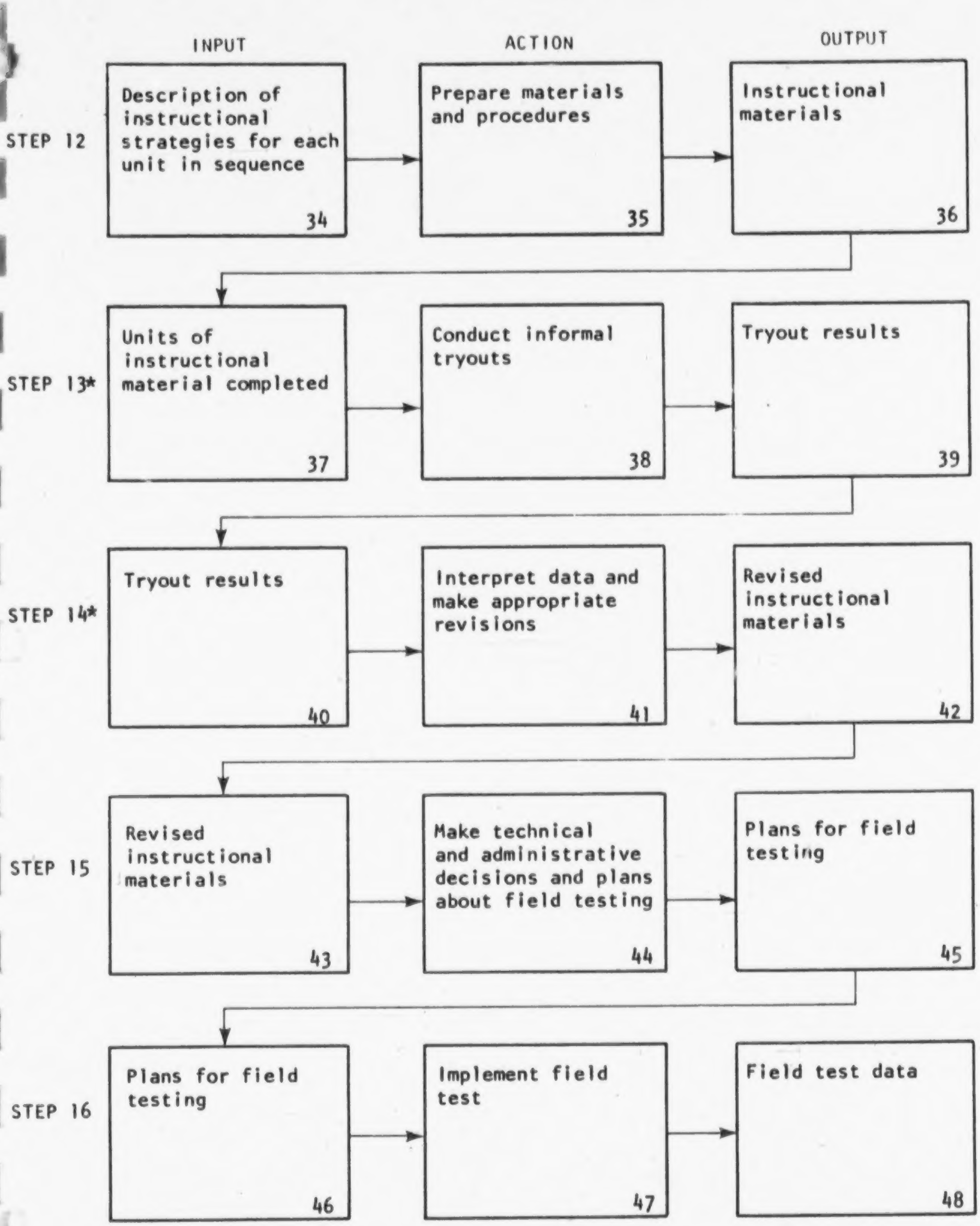


	INPUT	ACTION	OUTPUT
STEP 1	Potential need for educational development activity 1	Formulate statement of need on the basis of available information 2	Description of potential development need 3
STEP 2	Description of potential development need 4	Apply criteria of importance and feasibility in deciding whether or not to develop 5	Yes/no decision 6
STEP 3	Development task to pursue 7	Identify classes of terminal performance to be brought about or maintained 8	Identification of classes of terminal performance 9
STEP 4	Identification of classes of prescribed terminal performance 10	Determine kind of information necessary to specify terminal performance 11	Identification of existing and required information 12
STEP 5	a. Need for information to be reviewed b. Need for information to be collected 13	Analyze existing information Collect and analyze new information 14	Task description: behavioral specification of objectives 15
STEP 6	Raw data collected Step 5 and/or task description 16	Perform behavioral or other type of task analysis 17	Behavioral analysis 18

SUMMARY DIAGRAM
FOR ENTIRE PROCEDURAL CHAIN


INPUT
ACTION
OUTPUT
STEP 7
Behavioral analysis
19
Review component behaviors and formally identify required entering behavior
20
Identification of further, more detailed prerequisite behaviors
21
STEP 8
Behavioral analysis at appropriate level of detail
22
Perform learning analysis
23
Identification of learning difficulties, common components, etc.
24
STEP 9
Results of: behavioral analysis + learning analysis
25
Making chunking and sequencing decisions
26
Decisions about size and content of learning units and about sequences in which units should be presented
27
STEP 10
Learning units + task descriptions from Step 5 (statements of objectives)
28
Develop criterion performance tests
29
Criterion performance tests
30
either order
STEP 11
Learning units + sequences + identification of learning difficulties + common components + objectives + tests
31
Formulate instructional strategies
32
Description of instructional strategies for each unit
33

SUMMARY DIAGRAM
FOR ENTIRE PROCEDURAL CHAIN

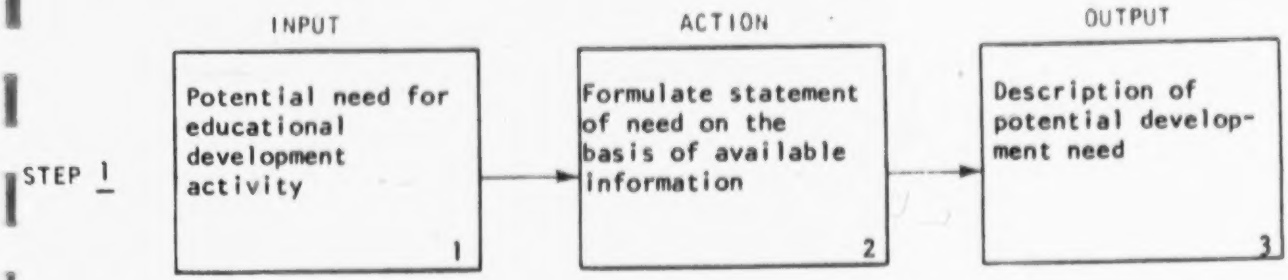

INPUT
ACTION
OUTPUT
STEP 12
Description of instructional strategies for each unit in sequence
34
Prepare materials and procedures
35
Instructional materials
36
STEP 13*
Units of instructional material completed
37
Conduct informal tryouts
38
Tryout results
39
STEP 14*
Tryout results
40
Interpret data and make appropriate revisions
41
Revised instructional materials
42
STEP 15
Revised instructional materials
43
Make technical and administrative decisions and plans about field testing
44
Plans for field testing
45
STEP 16
Plans for field testing
46
Implement field test
47
Field test data
48

*Steps 13 and 14 should be repeated until materials meet appropriate criterion of acceptability

from

step	1
cell	
page	1

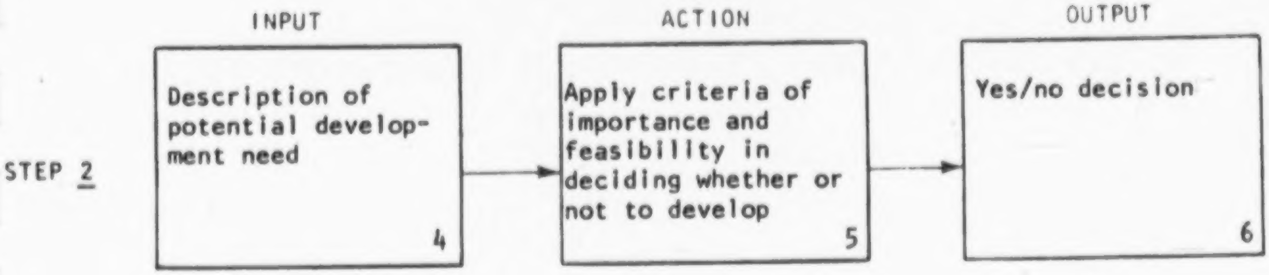
NO DETAILED ANALYSIS PROVIDED*


INPUT
ACTION
OUTPUT
STEP 1
Potential need for educational development activity
1
Formulate statement of need on the basis of available information
2
Description of potential development need
3

from

step	2
cell	
page	1

NO DETAILED ANALYSIS PROVIDED*

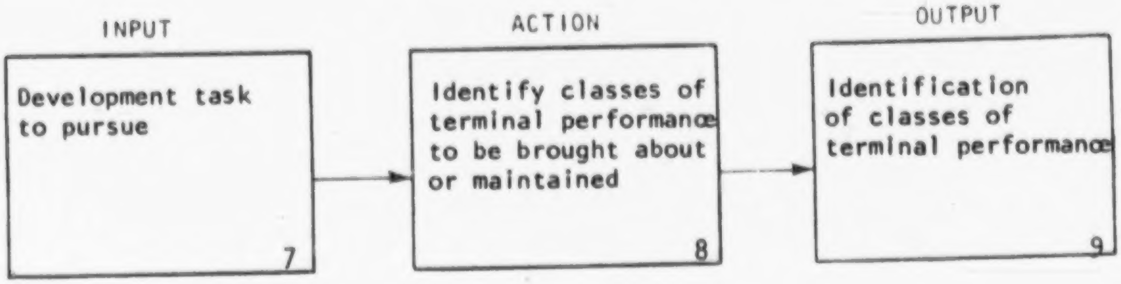

INPUT
ACTION
OUTPUT
STEP 2
Description of potential development need
4
Apply criteria of importance and feasibility in deciding whether or not to develop
5
Yes/no decision
6

from

step	3
cell	
page	1

DETAILED ANALYSIS FOR

STEP 3

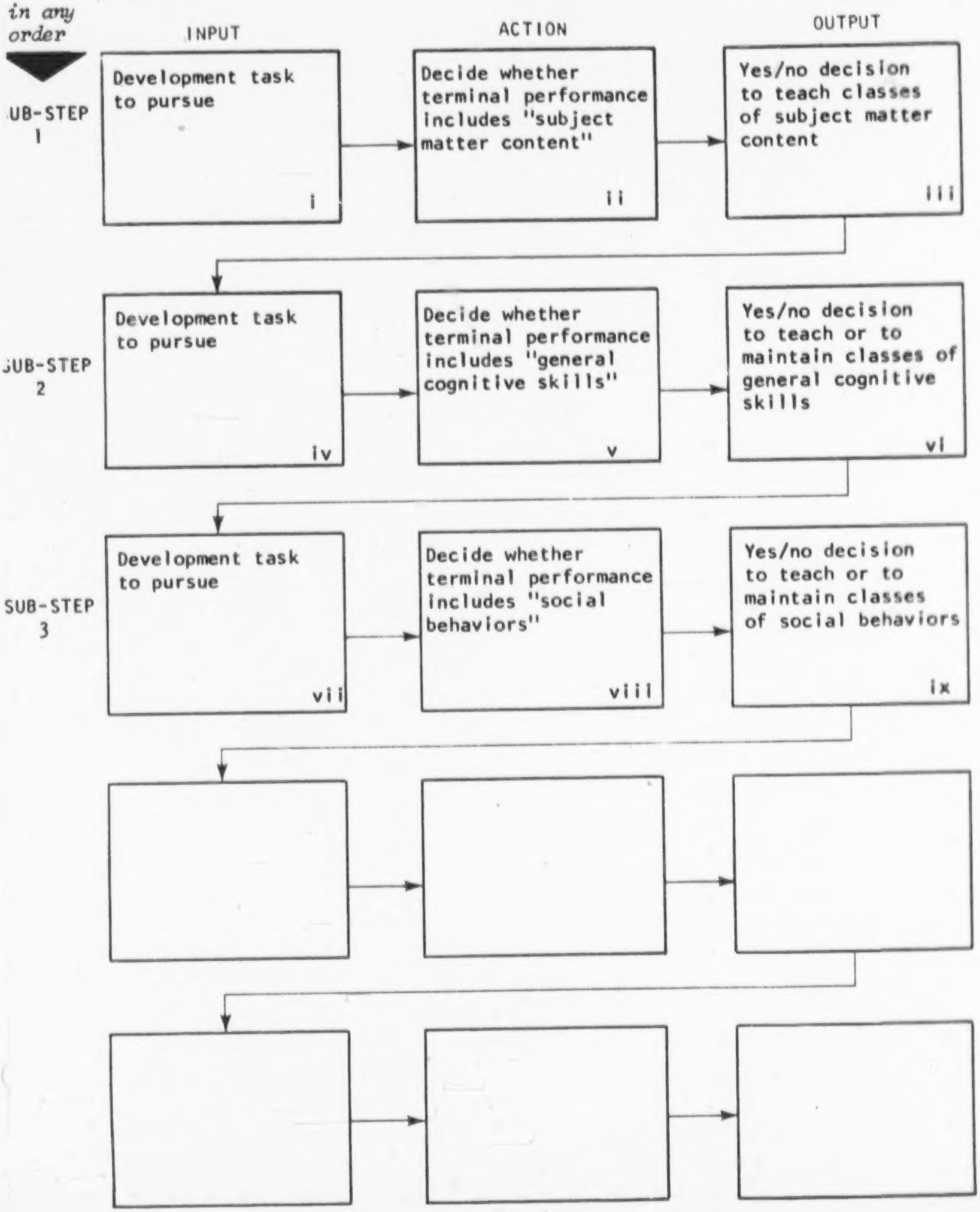

INPUT
ACTION
OUTPUT
Development task to pursue
7
Identify classes of terminal performance to be brought about or maintained
8
Identification of classes of terminal performance
9

ON NEXT 1 PAGE

from

step	3
cell	
page	1

MORE DETAILED DIAGRAM FOR CHAINS



in any order
INPUT
ACTION
OUTPUT
UB-STEP 1
Development task to pursue
i
Decide whether terminal performance includes "subject matter content"
ii
Yes/no decision to teach classes of subject matter content
iii
UB-STEP 2
Development task to pursue
iv
Decide whether terminal performance includes "general cognitive skills"
v
Yes/no decision to teach or to maintain classes of general cognitive skills
vi
SUB-STEP 3
Development task to pursue
vii
Decide whether terminal performance includes "social behaviors"
viii
Yes/no decision to teach or to maintain classes of social behaviors
ix

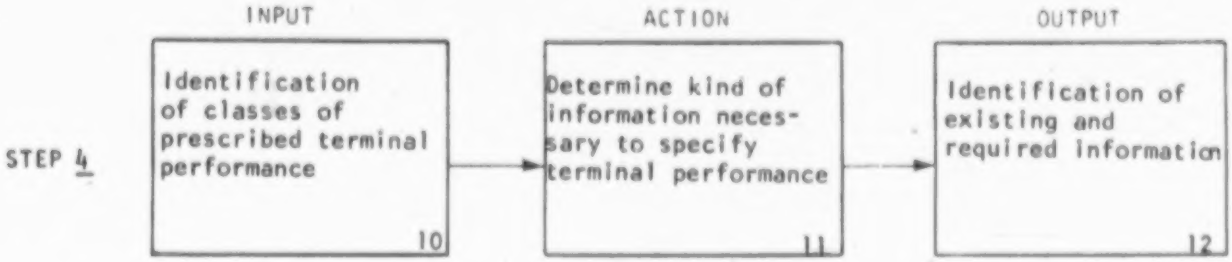
LIST OF FOLD-OUT PAGES

page 13
31
57
71
79
89
101
177

from

step	4
cell	
page	1

DETAILED ANALYSIS FOR


INPUT
ACTION
OUTPUT
STEP 4
Identification of classes of prescribed terminal performance
10
Determine kind of information necessary to specify terminal performance
11
Identification of existing and required information
12

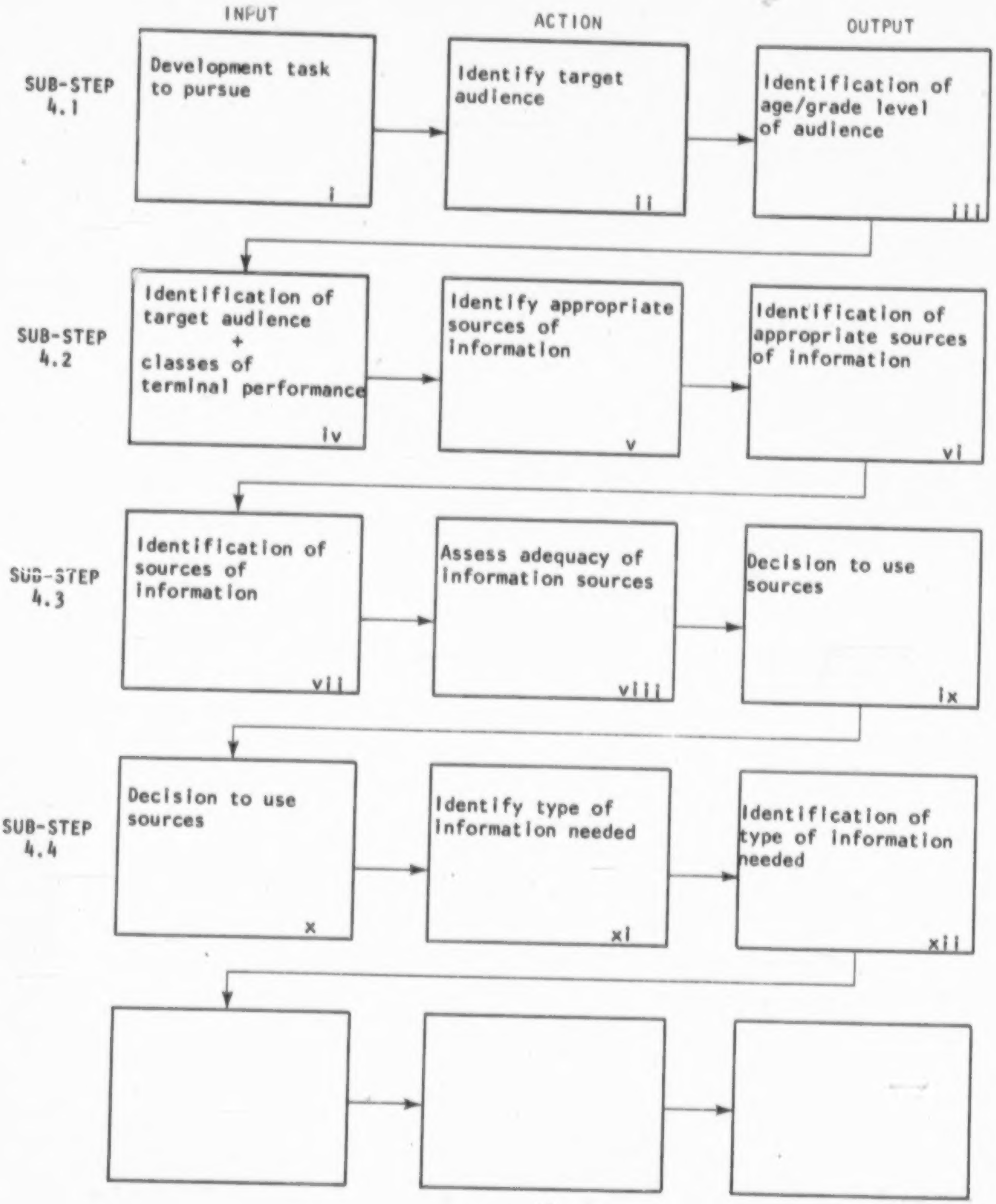
ON NEXT 16 PAGES

FOLD OUT THIS PAGE.

from

step	4
cell	
page	1

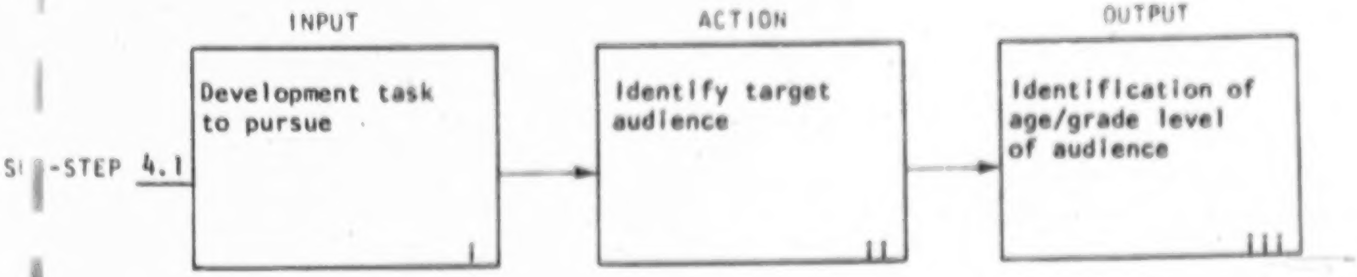
MORE DETAILED
DIAGRAM FOR CHAINS


INPUT
ACTION
OUTPUT
SUB-STEP 4.1
Development task to pursue
i
Identify target audience
ii
Identification of age/grade level of audience
iii
SUB-STEP 4.2
Identification of target audience + classes of terminal performance
iv
Identify appropriate sources of information
v
Identification of appropriate sources of information
vi
SUB-STEP 4.3
Identification of sources of information
vii
Assess adequacy of information sources
viii
Decision to use sources
ix
SUB-STEP 4.4
Decision to use sources
x
Identify type of information needed
xi
Identification of type of information needed
xii

from

step	4.1
cell	
page	14

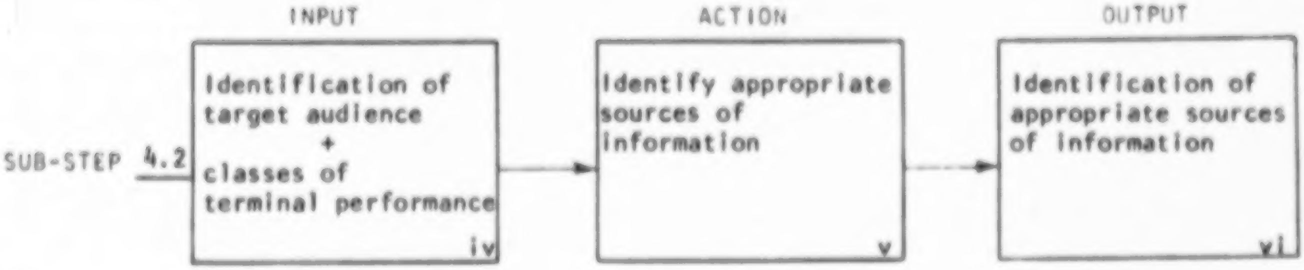
DETAILED ANALYSIS FOR


INPUT
ACTION
OUTPUT
Development task to pursue
Identify target audience
Identification of age/grade level of audience
S -STEP 4.1
I
II
III

from

step	4.2
cell	
page	14

DETAILED ANALYSIS FOR

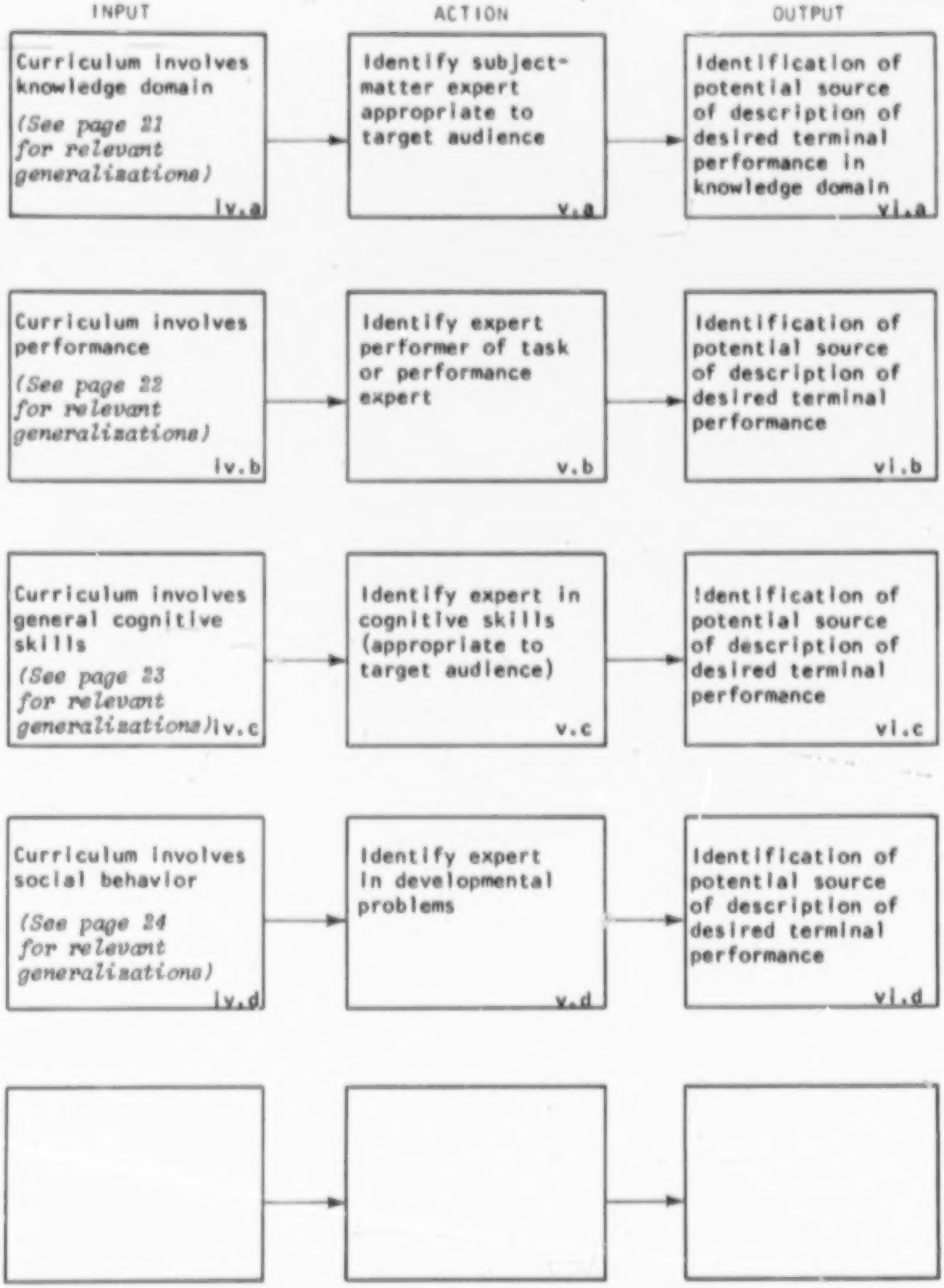

INPUT
ACTION
OUTPUT
SUB-STEP 4.2
Identification of target audience + classes of terminal performance
iv
Identify appropriate sources of information
v
Identification of appropriate sources of information
vi

ON NEXT 5 PAGES

from

step	4.2
cell	
page	14

MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS

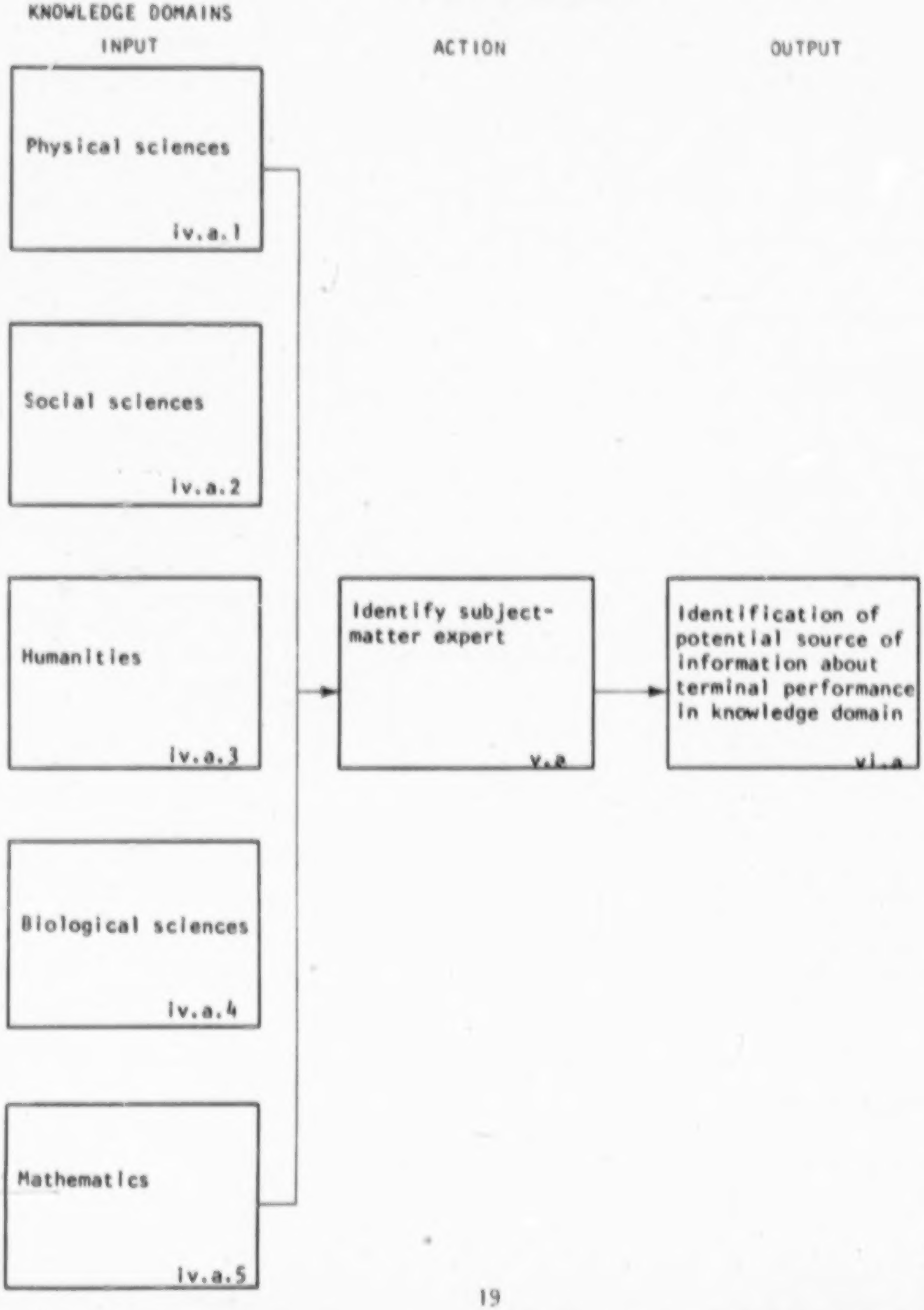


INPUT	ACTION	OUTPUT
Curriculum involves knowledge domain *(See page 21 for relevant generalizations)* iv.a	Identify subject-matter expert appropriate to target audience v.a	Identification of potential source of description of desired terminal performance in knowledge domain vi.a
Curriculum involves performance *(See page 22 for relevant generalizations)* iv.b	Identify expert performer of task or performance expert v.b	Identification of potential source of description of desired terminal performance vi.b
Curriculum involves general cognitive skills *(See page 23 for relevant generalizations)* iv.c	Identify expert in cognitive skills (appropriate to target audience) v.c	Identification of potential source of description of desired terminal performance vi.c
Curriculum involves social behavior *(See page 24 for relevant generalizations)* iv.d	Identify expert in developmental problems v.d	Identification of potential source of description of desired terminal performance vi.d

from

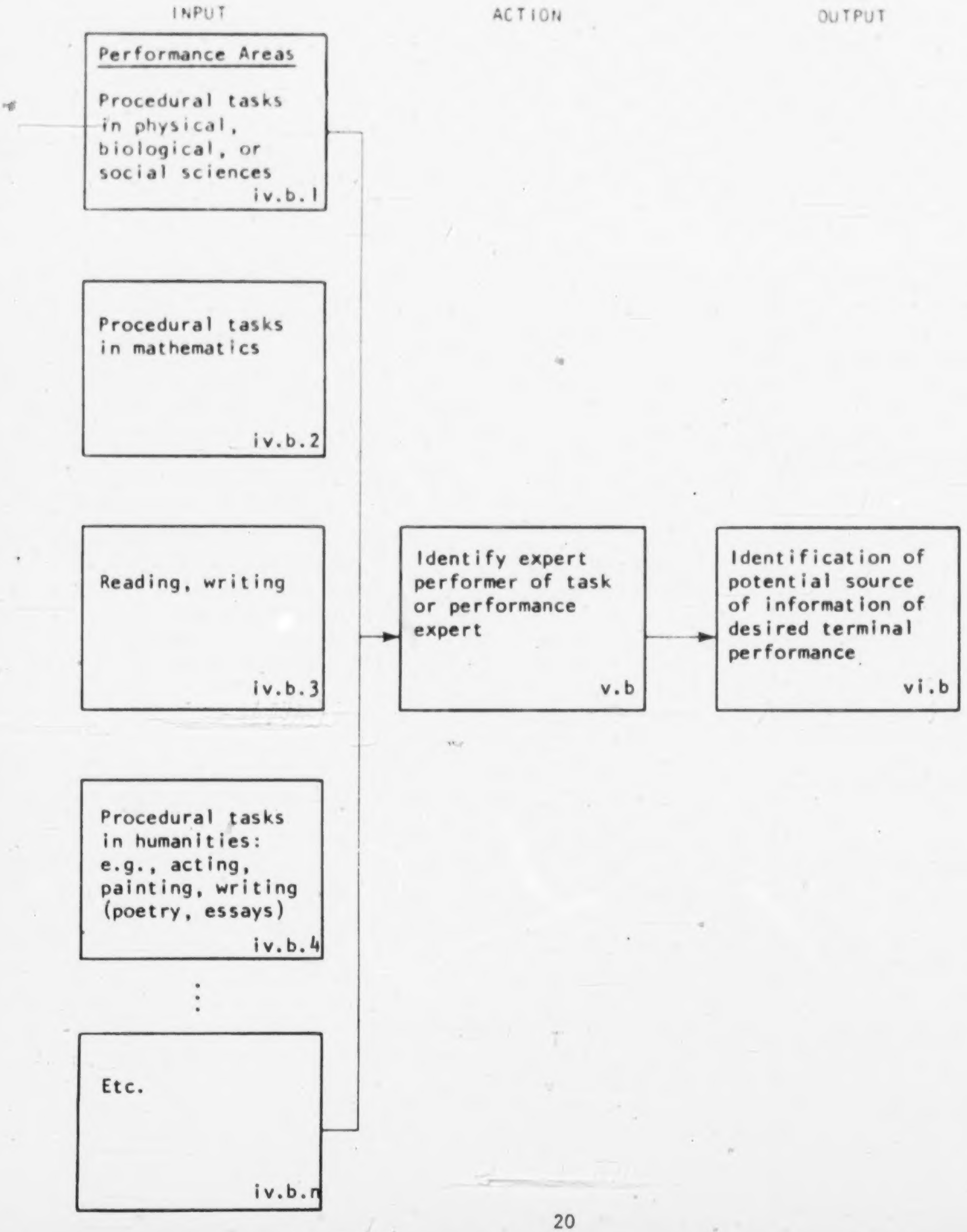
step	4.2
cell	iv.a
page	18

MORE DETAILED DIAGRAM FOR GENERALIZATIONS


KNOWLEDGE DOMAINS
INPUT
ACTION
OUTPUT
Physical sciences
iv.a.1
Social sciences
iv.a.2
Humanities
iv.a.3
Biological sciences
iv.a.4
Mathematics
iv.a.5
Identify subject-matter expert
v.a
Identification of potential source of information about terminal performance in knowledge domain
vi.a

from	
step	4.2
cell	iv.b
page	18

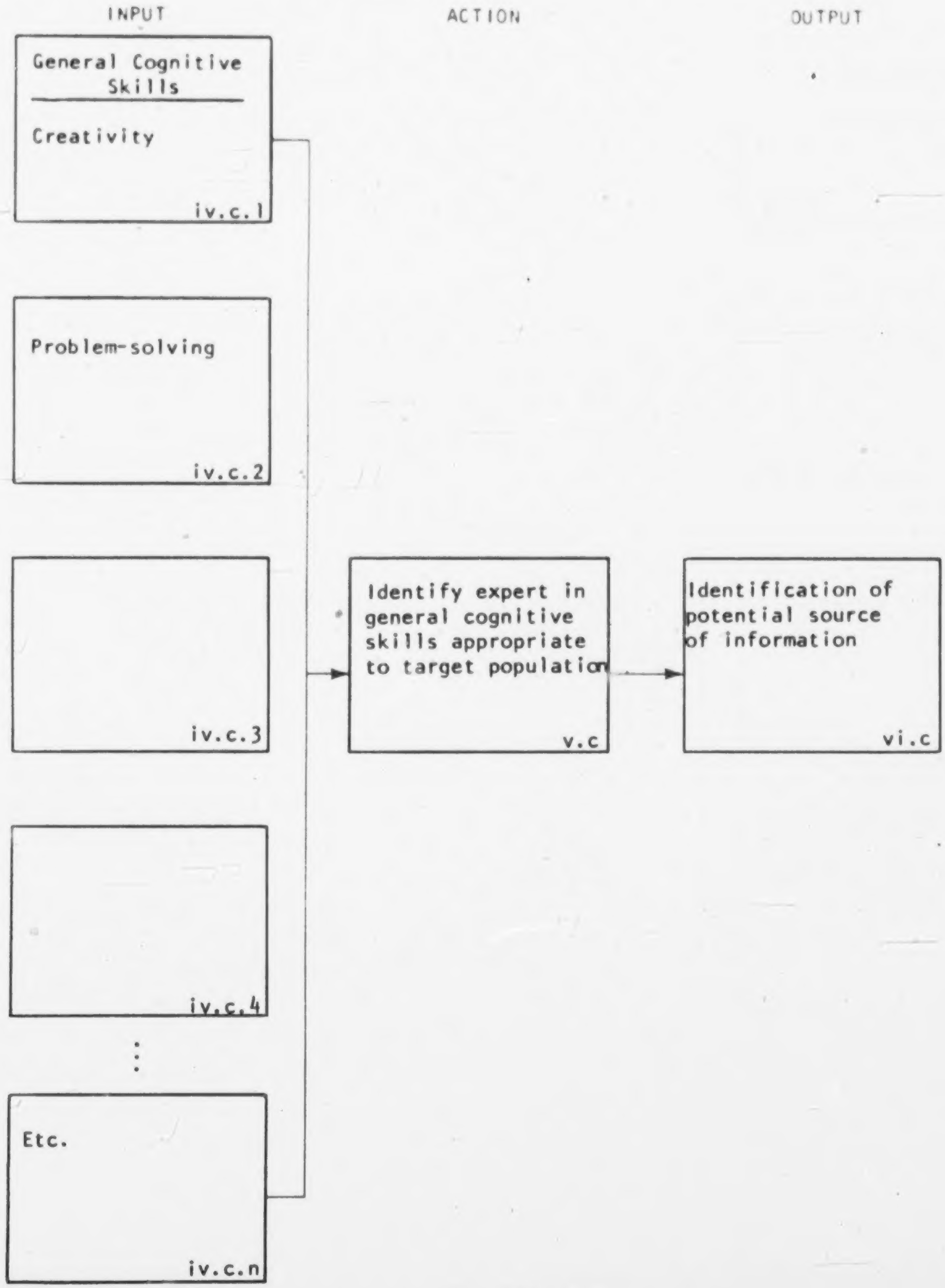
MORE DETAILED
DIAGRAM FOR GENERALIZATIONS


INPUT
ACTION
OUTPUT
Performance Areas
Procedural tasks in physical, biological, or social sciences
iv.b.1
Procedural tasks in mathematics
iv.b.2
Reading, writing
iv.b.3
Procedural tasks in humanities: e.g., acting, painting, writing (poetry, essays)
iv.b.4
Etc.
iv.b.n
Identify expert performer of task or performance expert
v.b
Identification of potential source of information of desired terminal performance
vi.b

from

step	4.2
cell	iv.c
page	18

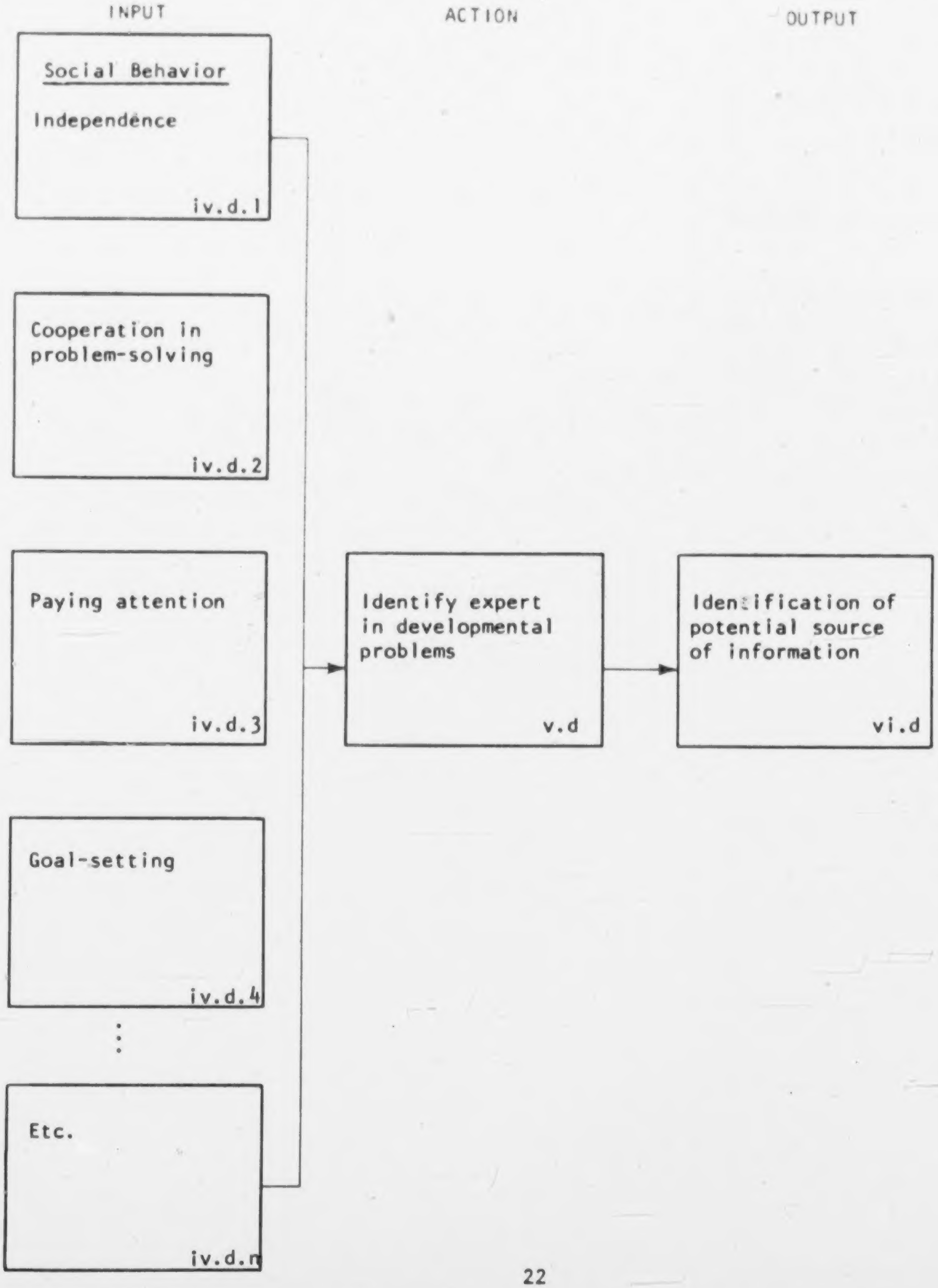
MORE DETAILED
DIAGRAM FOR GENERALIZATIONS


INPUT
ACTION
OUTPUT
General Cognitive Skills
Creativity
iv.c.1
Problem-solving
iv.c.2
iv.c.3
iv.c.4
Etc.
iv.c.n
Identify expert in general cognitive skills appropriate to target population
v.c
Identification of potential source of information
vi.c

from

step	4.2
cell	iv.d
page	18

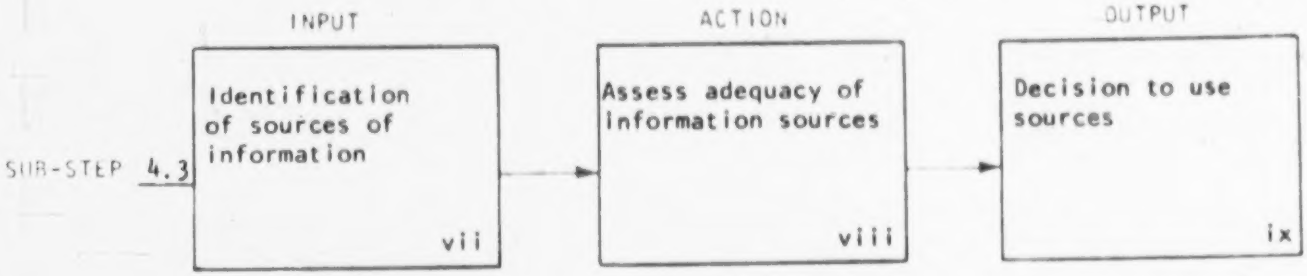
MORE DETAILED
DIAGRAM FOR GENERALIZATIONS


INPUT
ACTION
OUTPUT
Social Behavior
Independence
iv.d.1
Cooperation in problem-solving
iv.d.2
Paying attention
iv.d.3
Goal-setting
iv.d.4
Etc.
iv.d.n
Identify expert in developmental problems
v.d
Identification of potential source of information
vi.d

from

step	4.3
cell	
page	14

DETAILED ANALYSIS FOR


INPUT
ACTION
OUTPUT
SUB-STEP 4.3
Identification of sources of information
vii
Assess adequacy of information sources
viii
Decision to use sources
ix

ON NEXT 3 PAGES

from

step	4.3
cell	
page	14

MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS

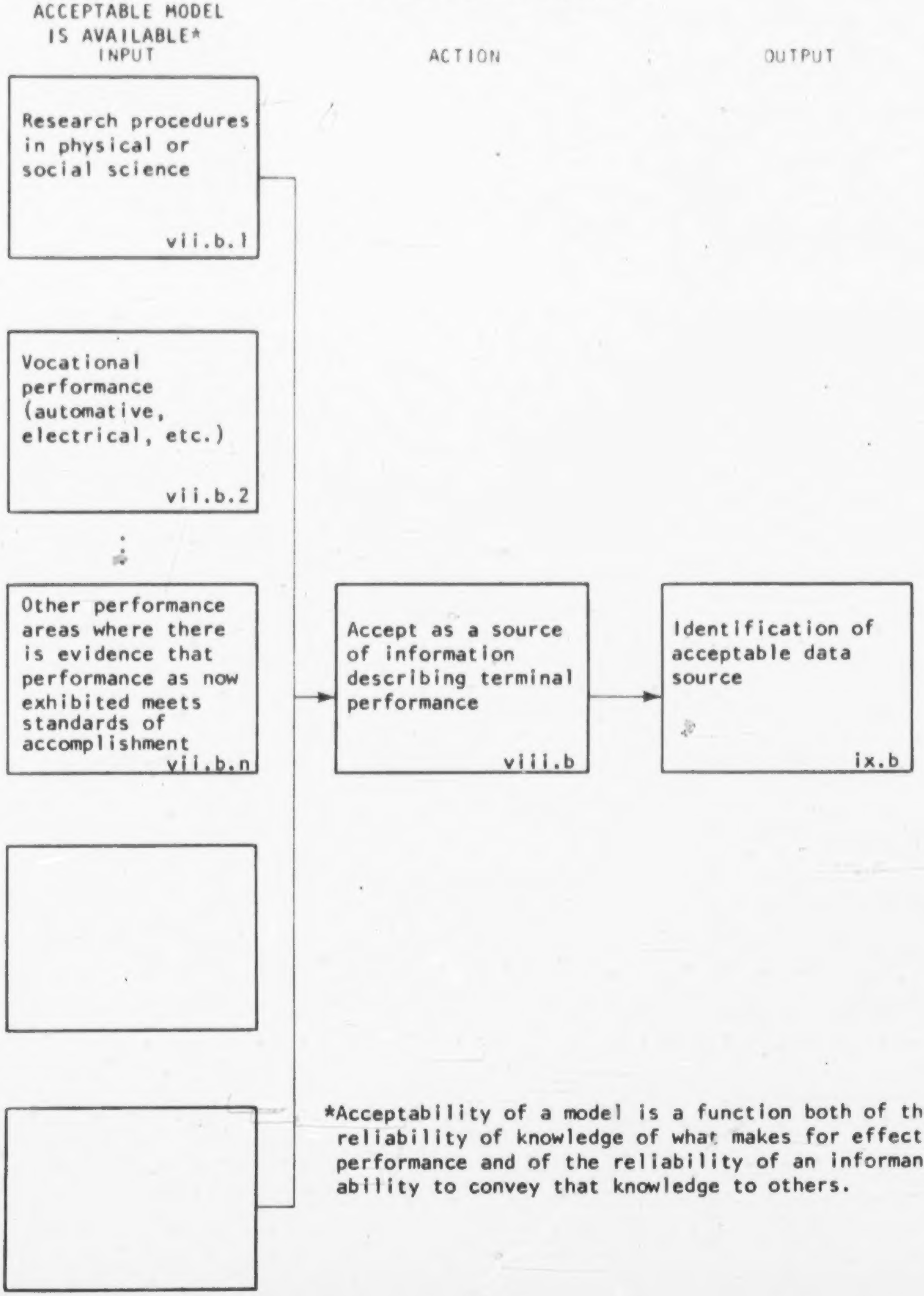
INPUT	ACTION	OUTPUT
Expert in knowledge domain, in general cognitive skills, or in social behavior vii.a	Accept as source of information viii.a	Identification of acceptable data source ix.a
Area in which acceptable model of performance is available *(See page 27)* vii.b	Accept as source of information describing terminal performance viii.b	Identification of appropriate data source ix.b
Performance area in which acceptable model is not available* *(See page 28)* vii.c	Identify theory or hypotheses as sources for description of acceptable model viii.c	Identification of acceptable data source ix.c

*Or uncertainty exists as to its acceptability.

from

step	4.3
cell	
page	14

MORE DETAILED
DIAGRAM FOR GENERALIZATIONS

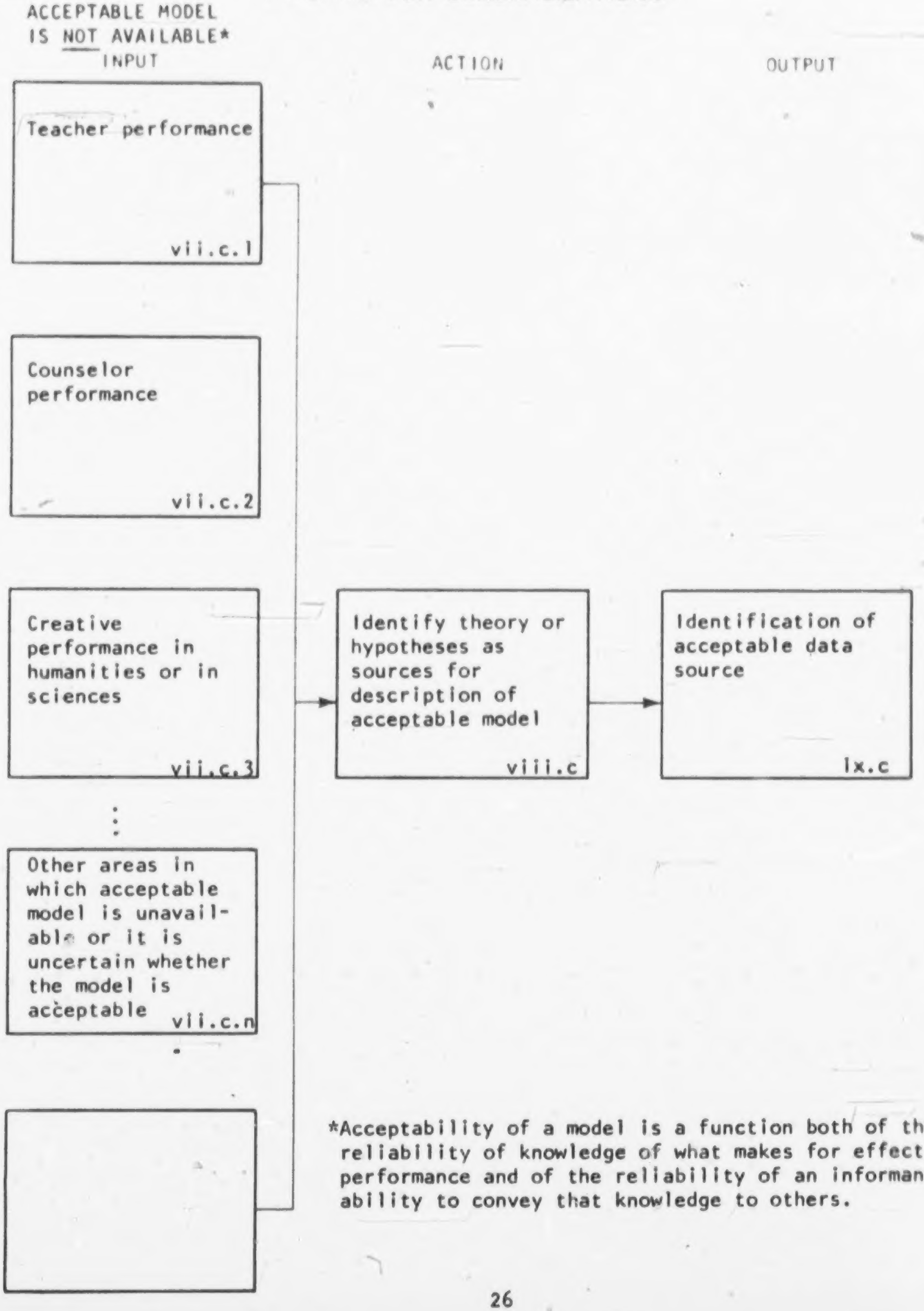

ACCEPTABLE MODEL IS AVAILABLE*
INPUT
ACTION
OUTPUT
Research procedures in physical or social science
vii.b.1
Vocational performance (automative, electrical, etc.)
vii.b.2
Other performance areas where there is evidence that performance as now exhibited meets standards of accomplishment
vii.b.n
Accept as a source of information describing terminal performance
viii.b
Identification of acceptable data source
ix.b

*Acceptability of a model is a function both of the reliability of knowledge of what makes for effective performance and of the reliability of an informant's ability to convey that knowledge to others.

from

step	4.3
cell	
page	14

MORE DETAILED DIAGRAM FOR GENERALIZATIONS

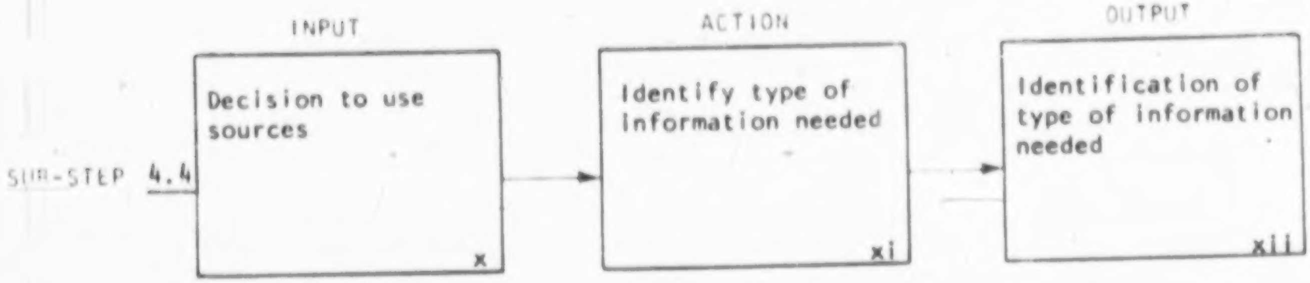

ACCEPTABLE MODEL IS NOT AVAILABLE*
INPUT
ACTION
OUTPUT
Teacher performance
vii.c.1
Counselor performance
vii.c.2
Creative performance in humanities or in sciences
vii.c.3
Other areas in which acceptable model is unavailable or it is uncertain whether the model is acceptable
vii.c.n
Identify theory or hypotheses as sources for description of acceptable model
viii.c
Identification of acceptable data source
ix.c

*Acceptability of a model is a function both of the reliability of knowledge of what makes for effective performance and of the reliability of an informant's ability to convey that knowledge to others.

from

step	4.4
cell	
page	14

DETAILED ANALYSIS FOR

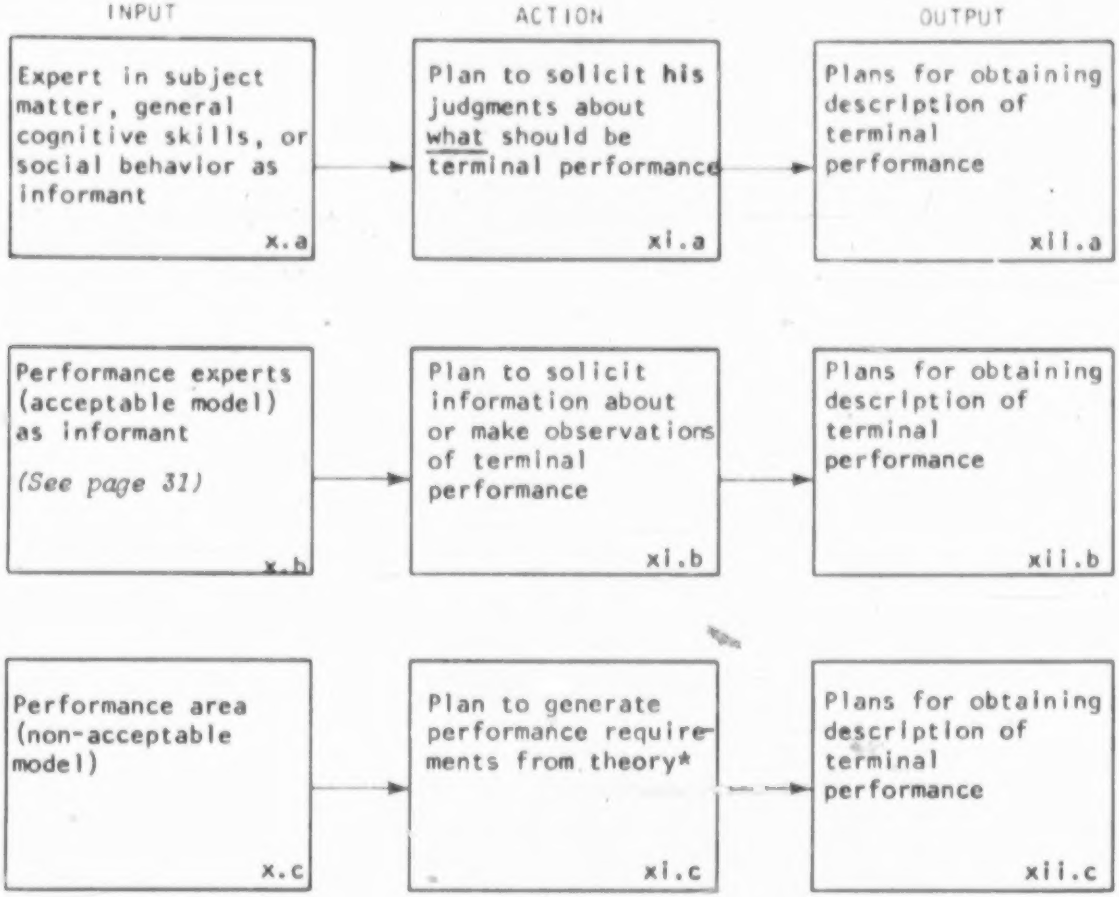

INPUT
ACTION
OUTPUT
SUB-STEP 4.4
Decision to use sources
x
Identify type of information needed
xi
Identification of type of information needed
xii

ON NEXT 2 PAGES

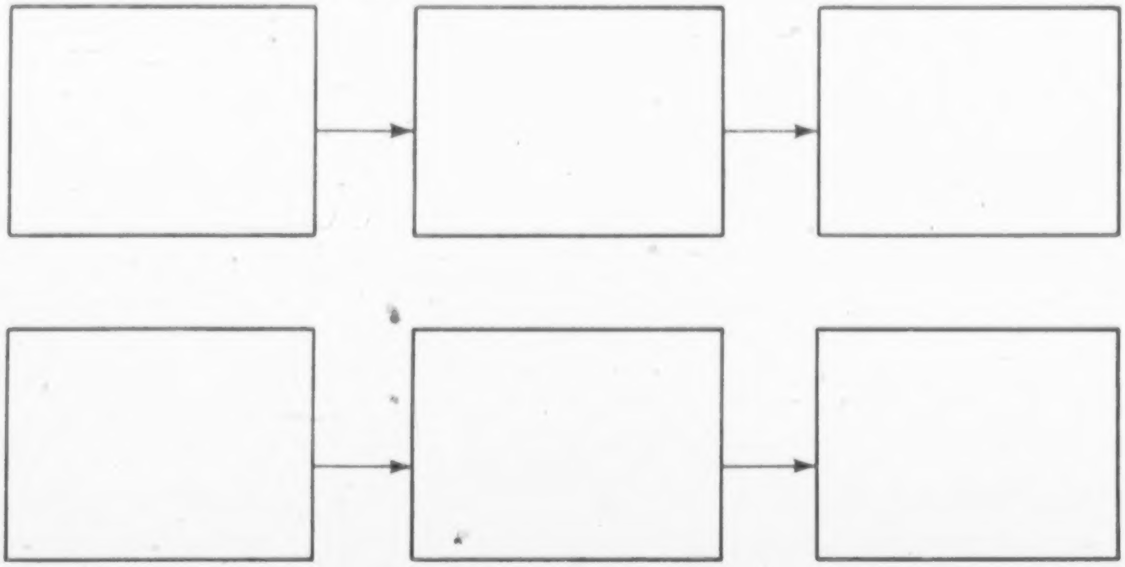
from

step	4.4
cell	
page	14

MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS


INPUT
ACTION
OUTPUT
Expert in subject matter, general cognitive skills, or social behavior as informant
x.a
Plan to solicit his judgments about what should be terminal performance
xi.a
Plans for obtaining description of terminal performance
xii.a
Performance experts (acceptable model) as informant
(See page 31)
x.b
Plan to solicit information about or make observations of terminal performance
xi.b
Plans for obtaining description of terminal performance
xii.b
Performance area (non-acceptable model)
x.c
Plan to generate performance requirements from theory*
xi.c
Plans for obtaining description of terminal performance
xii.c

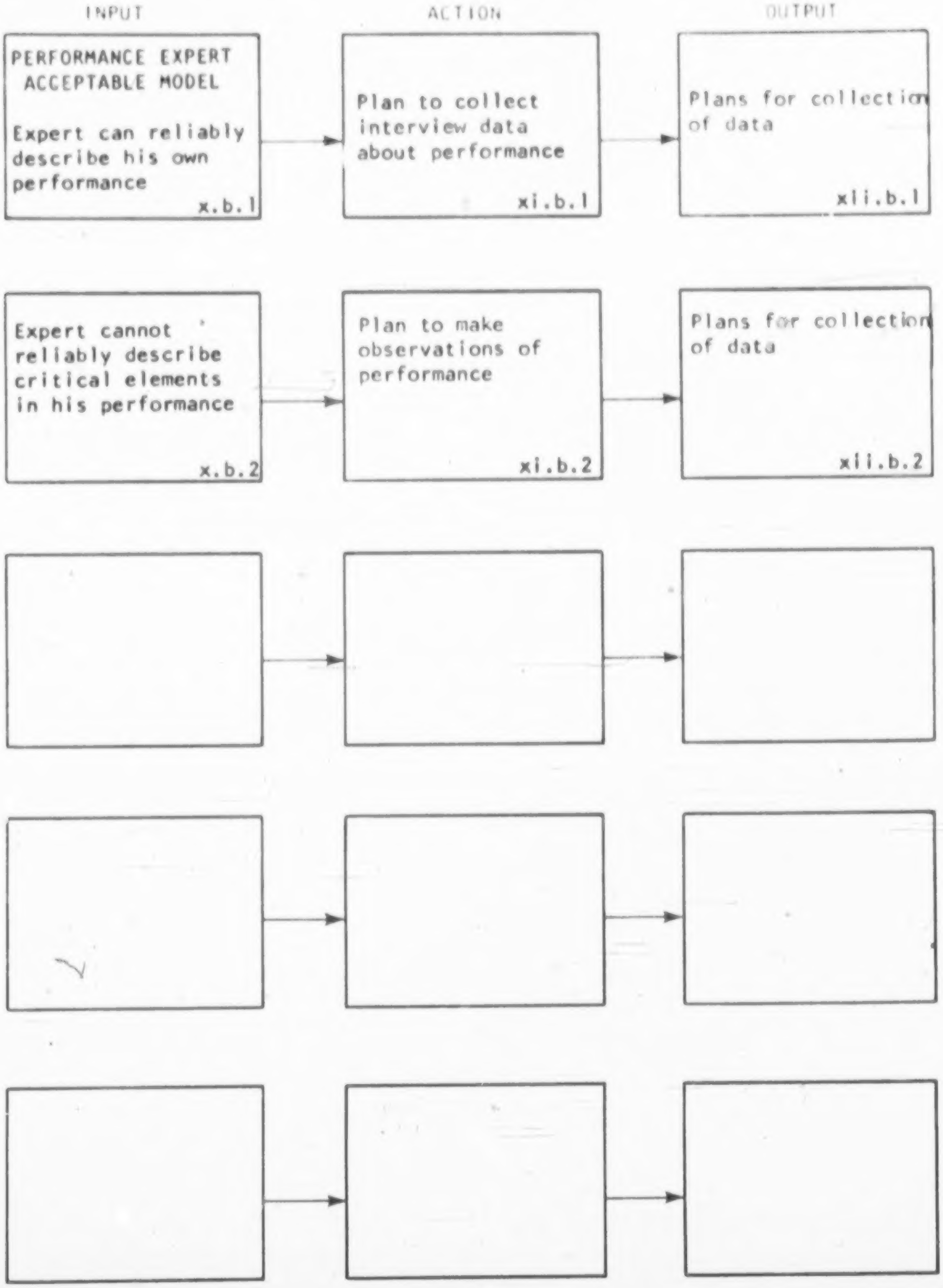
*Ultimately, to be validated by research.



from

step	4.4
cell	x.b
page	28

MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS

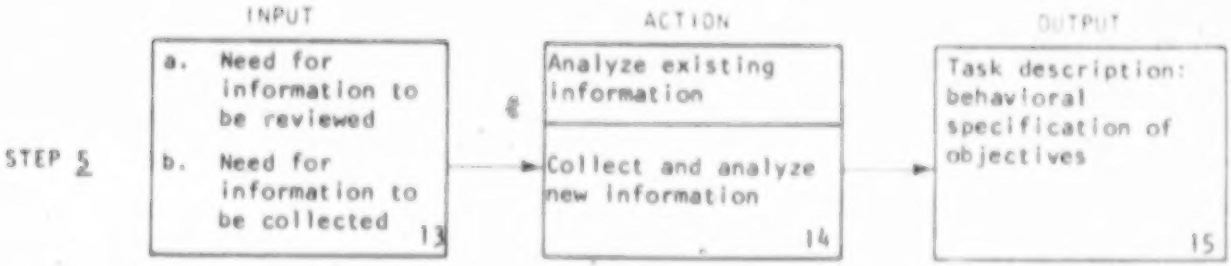

INPUT
ACTION
OUTPUT
PERFORMANCE EXPERT ACCEPTABLE MODEL
Expert can reliably describe his own performance
x.b.1
Plan to collect interview data about performance
xi.b.1
Plans for collectio of data
xii.b.1
Expert cannot reliably describe critical elements in his performance
x.b.2
Plan to make observations of performance
xi.b.2
Plans for collection of data
xii.b.2

FOLD BACK
PAGE 13.

from

step	5
cell	
page	1

DETAILED ANALYSIS FOR

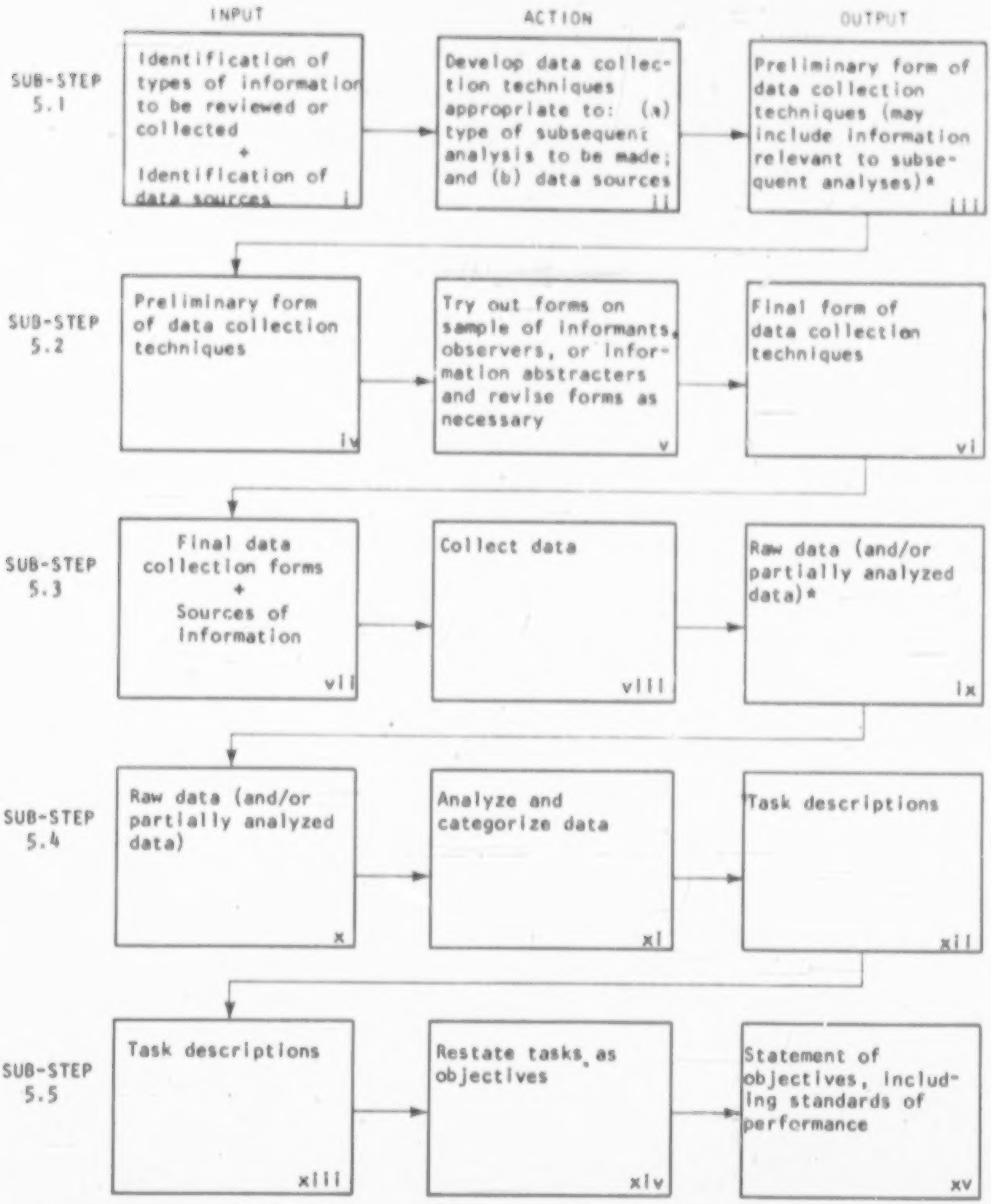

STEP 5
INPUT
a. Need for information to be reviewed
b. Need for information to be collected
13
ACTION
Analyze existing information
Collect and analyze new information
14
OUTPUT
Task description: behavioral specification of objectives
15

ON NEXT 25 PAGES

FOLD OUT
THIS PAGE.

from	
step	5
cell	
page	1

MORE DETAILED DIAGRAM FOR CHAINS



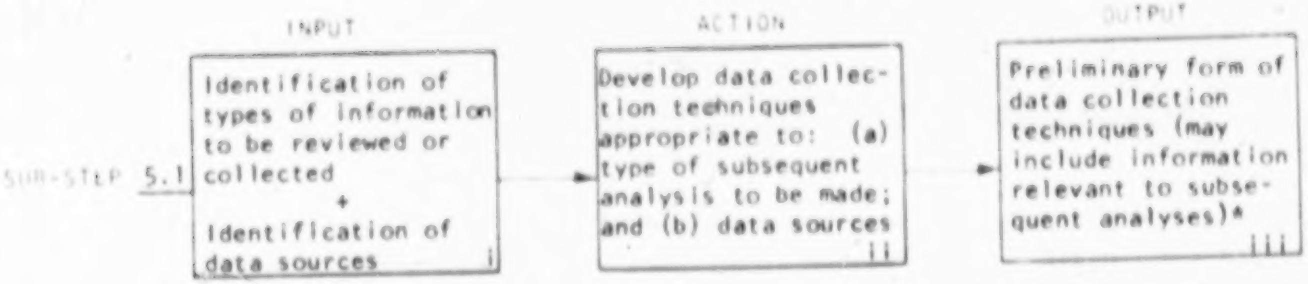
	INPUT	ACTION	OUTPUT
SUB-STEP 5.1	Identification of types of information to be reviewed or collected + Identification of data sources i	Develop data collection techniques appropriate to: (a) type of subsequent analysis to be made; and (b) data sources ii	Preliminary form of data collection techniques (may include information relevant to subsequent analyses)* iii
SUB-STEP 5.2	Preliminary form of data collection techniques iv	Try out forms on sample of informants, observers, or information abstracters and revise forms as necessary v	Final form of data collection techniques vi
SUB-STEP 5.3	Final data collection forms + Sources of information vii	Collect data viii	Raw data (and/or partially analyzed data)* ix
SUB-STEP 5.4	Raw data (and/or partially analyzed data) x	Analyze and categorize data xi	Task descriptions xii
SUB-STEP 5.5	Task descriptions xiii	Restate tasks as objectives xiv	Statement of objectives, including standards of performance xv

Task analysis may be performed as data are collected, or it may be performed _after_ objectives are formulated.

from

step	5.1
cell	
page	32

DETAILED ANALYSIS FOR



Identification of types of information to be reviewed or collected
+
Identification of data sources

Develop data collection techniques appropriate to: (a) type of subsequent analysis to be made; and (b) data sources

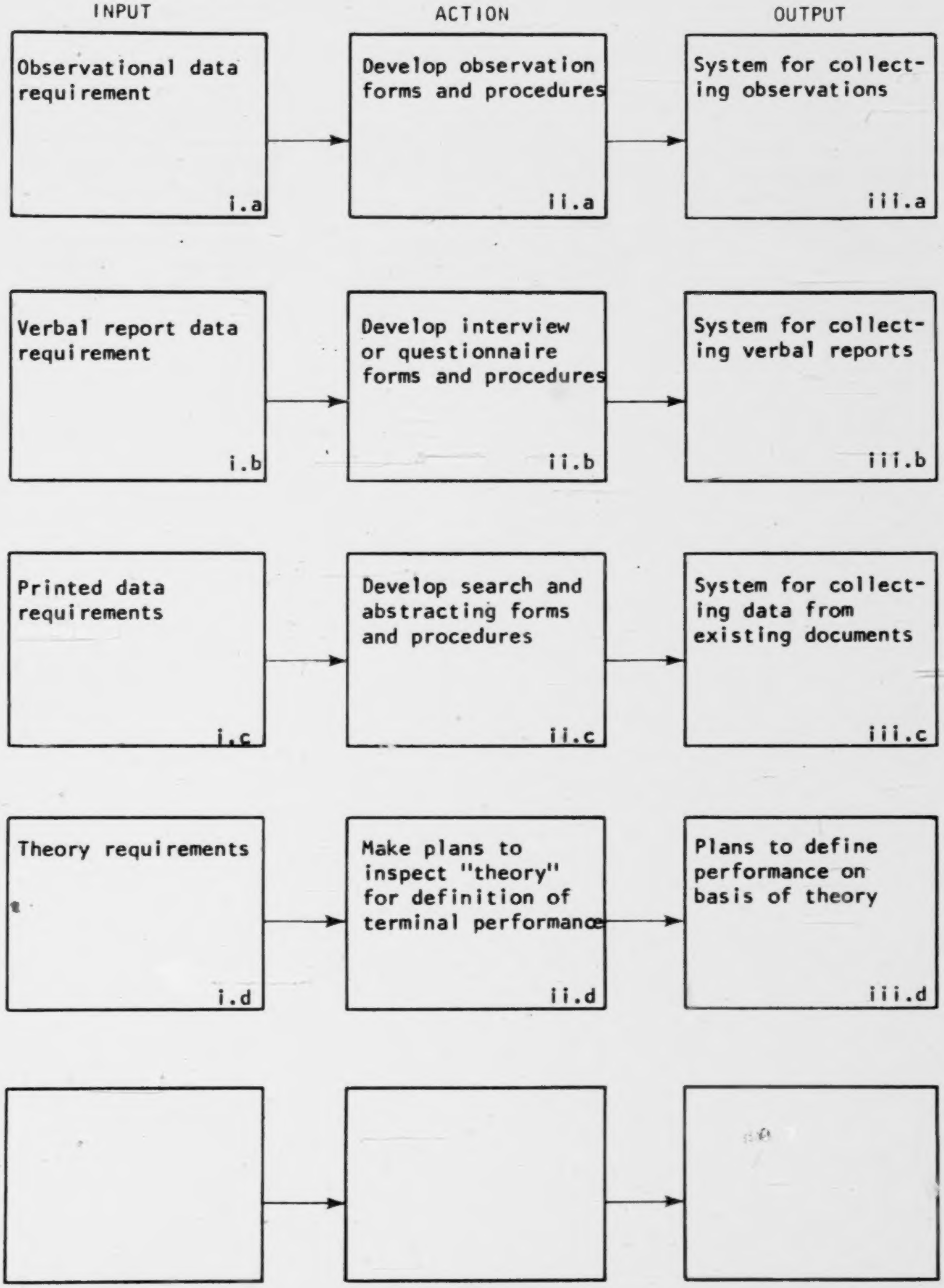
Preliminary form of data collection techniques (may include information relevant to subsequent analyses)*

ON NEXT 7 PAGES

from

step	5.1
cell	i
page	32

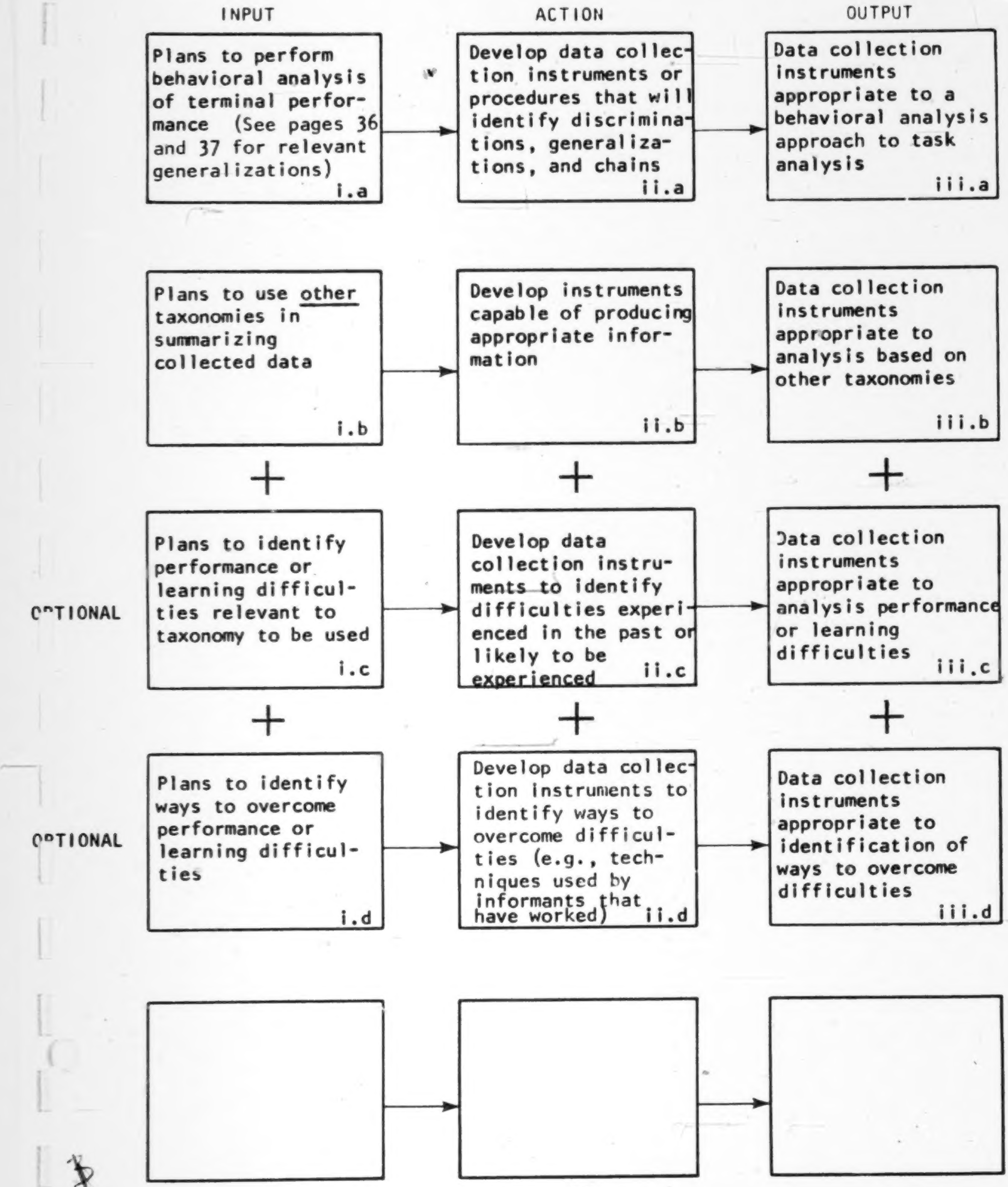
MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS (1)


INPUT
ACTION
OUTPUT
Observational data requirement
i.a
Develop observation forms and procedures
ii.a
System for collecting observations
iii.a
Verbal report data requirement
i.b
Develop interview or questionnaire forms and procedures
ii.b
System for collecting verbal reports
iii.b
Printed data requirements
i.c
Develop search and abstracting forms and procedures
ii.c
System for collecting data from existing documents
iii.c
Theory requirements
i.d
Make plans to inspect "theory" for definition of terminal performance
ii.d
Plans to define performance on basis of theory
iii.d

from

step	5.1
cell	i
page	32

MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS (2)



	INPUT	ACTION	OUTPUT
	Plans to perform behavioral analysis of terminal performance (See pages 36 and 37 for relevant generalizations) i.a	Develop data collection instruments or procedures that will identify discriminations, generalizations, and chains ii.a	Data collection instruments appropriate to a behavioral analysis approach to task analysis iii.a
	Plans to use other taxonomies in summarizing collected data i.b	Develop instruments capable of producing appropriate information ii.b	Data collection instruments appropriate to analysis based on other taxonomies iii.b
	+	+	+
OPTIONAL	Plans to identify performance or learning difficulties relevant to taxonomy to be used i.c	Develop data collection instruments to identify difficulties experienced in the past or likely to be experienced ii.c	Data collection instruments appropriate to analysis performance or learning difficulties iii.c
	+	+	+
OPTIONAL	Plans to identify ways to overcome performance or learning difficulties i.d	Develop data collection instruments to identify ways to overcome difficulties (e.g., techniques used by informants that have worked) ii.d	Data collection instruments appropriate to identification of ways to overcome difficulties iii.d

from

step	5.1
cell	i.a*
page	35

MORE DETAILED
DIAGRAM FOR GENERALIZATIONS (1)

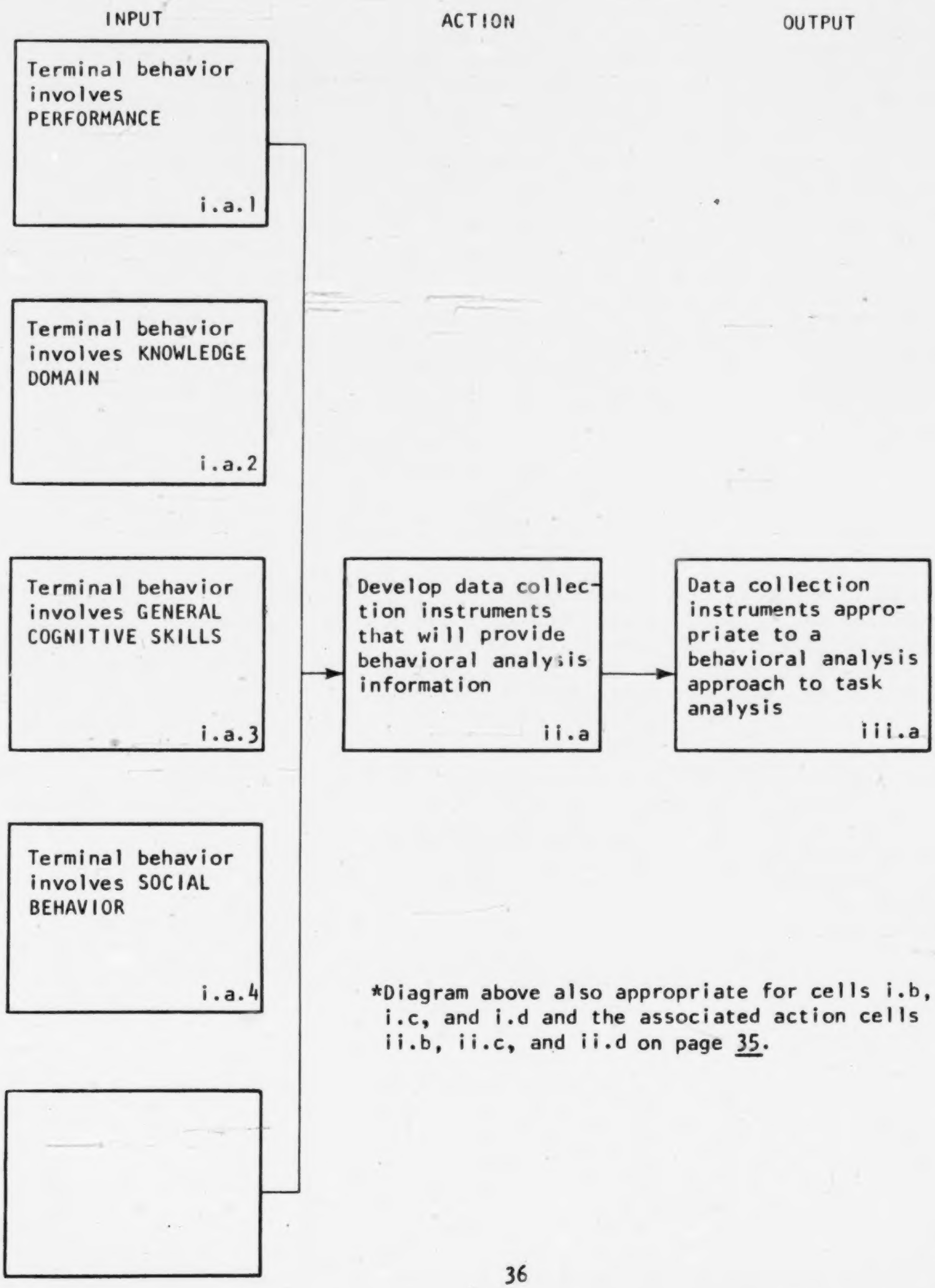
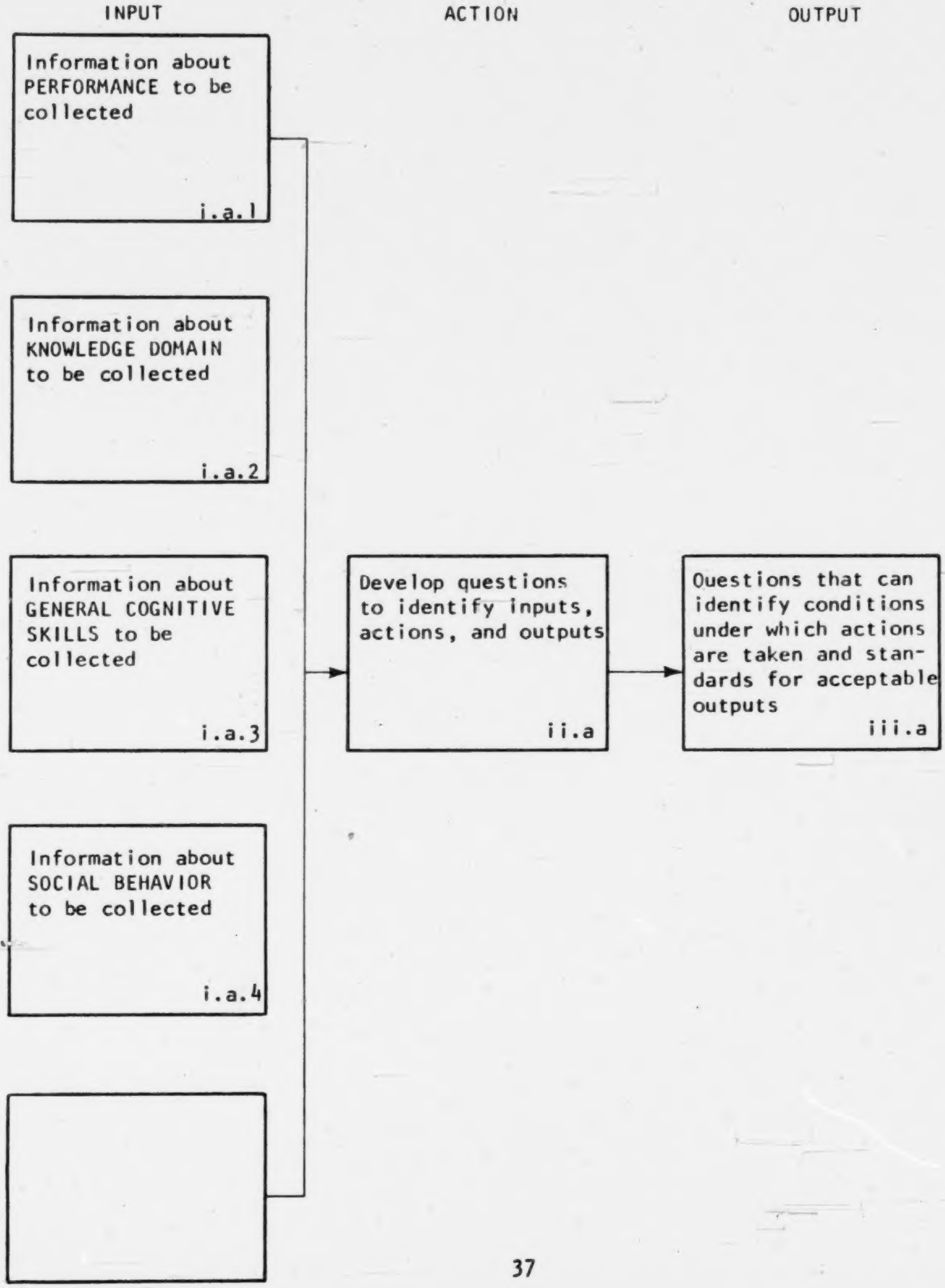

INPUT
ACTION
OUTPUT
Terminal behavior involves PERFORMANCE
i.a.1
Terminal behavior involves KNOWLEDGE DOMAIN
i.a.2
Terminal behavior involves GENERAL COGNITIVE SKILLS
i.a.3
Terminal behavior involves SOCIAL BEHAVIOR
i.a.4
Develop data collection instruments that will provide behavioral analysis information
ii.a
Data collection instruments appropriate to a behavioral analysis approach to task analysis
iii.a

*Diagram above also appropriate for cells i.b, i.c, and i.d and the associated action cells ii.b, ii.c, and ii.d on page 35.

from

step	5.1
cell	i.a
page	35

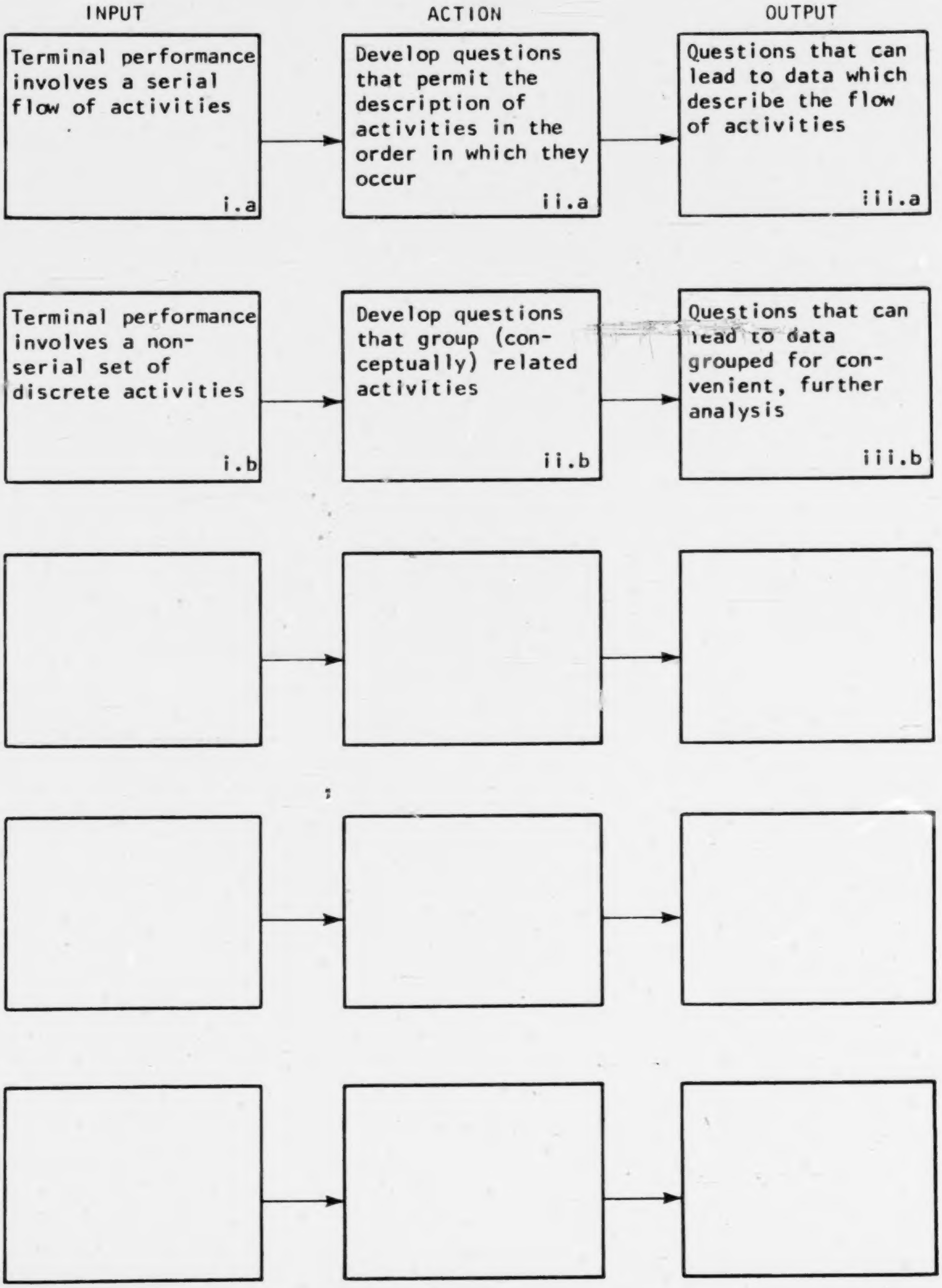
MORE DETAILED DIAGRAM FOR GENERALIZATIONS (2)


INPUT
ACTION
OUTPUT
Information about PERFORMANCE to be collected
i.a.1
Information about KNOWLEDGE DOMAIN to be collected
i.a.2
Information about GENERAL COGNITIVE SKILLS to be collected
i.a.3
Information about SOCIAL BEHAVIOR to be collected
i.a.4
Develop questions to identify inputs, actions, and outputs
ii.a
Questions that can identify conditions under which actions are taken and standards for acceptable outputs
iii.a

from

step	5.1
cell	i
page	32

MORE DETAILED DIAGRAM FOR DISCRIMINATIONS (3)

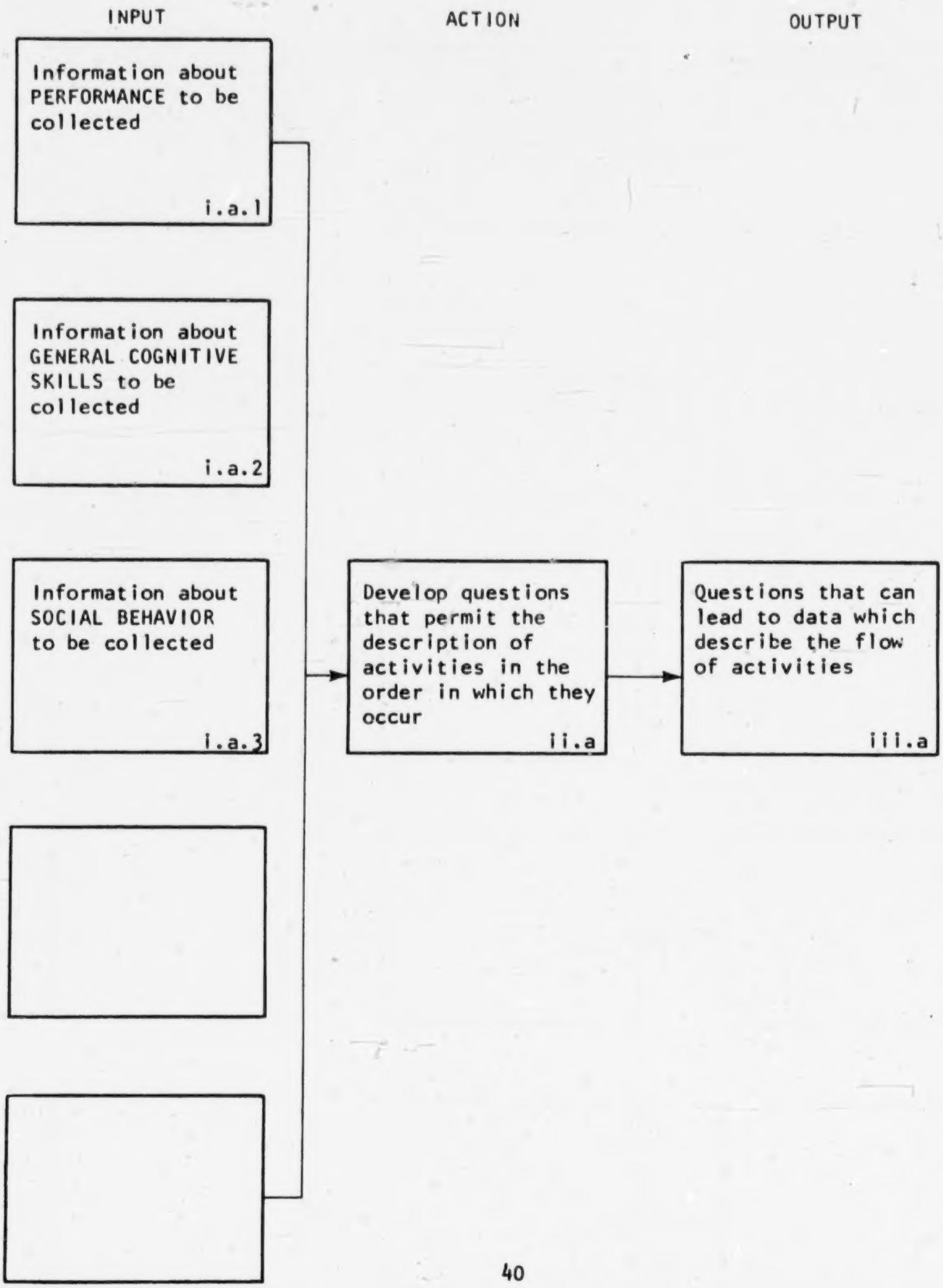


INPUT	ACTION	OUTPUT
Terminal performance involves a serial flow of activities i.a	Develop questions that permit the description of activities in the order in which they occur ii.a	Questions that can lead to data which describe the flow of activities iii.a
Terminal performance involves a non-serial set of discrete activities i.b	Develop questions that group (conceptually) related activities ii.b	Questions that can lead to data grouped for convenient, further analysis iii.b

from

step	5.1
cell	i.a
page	39

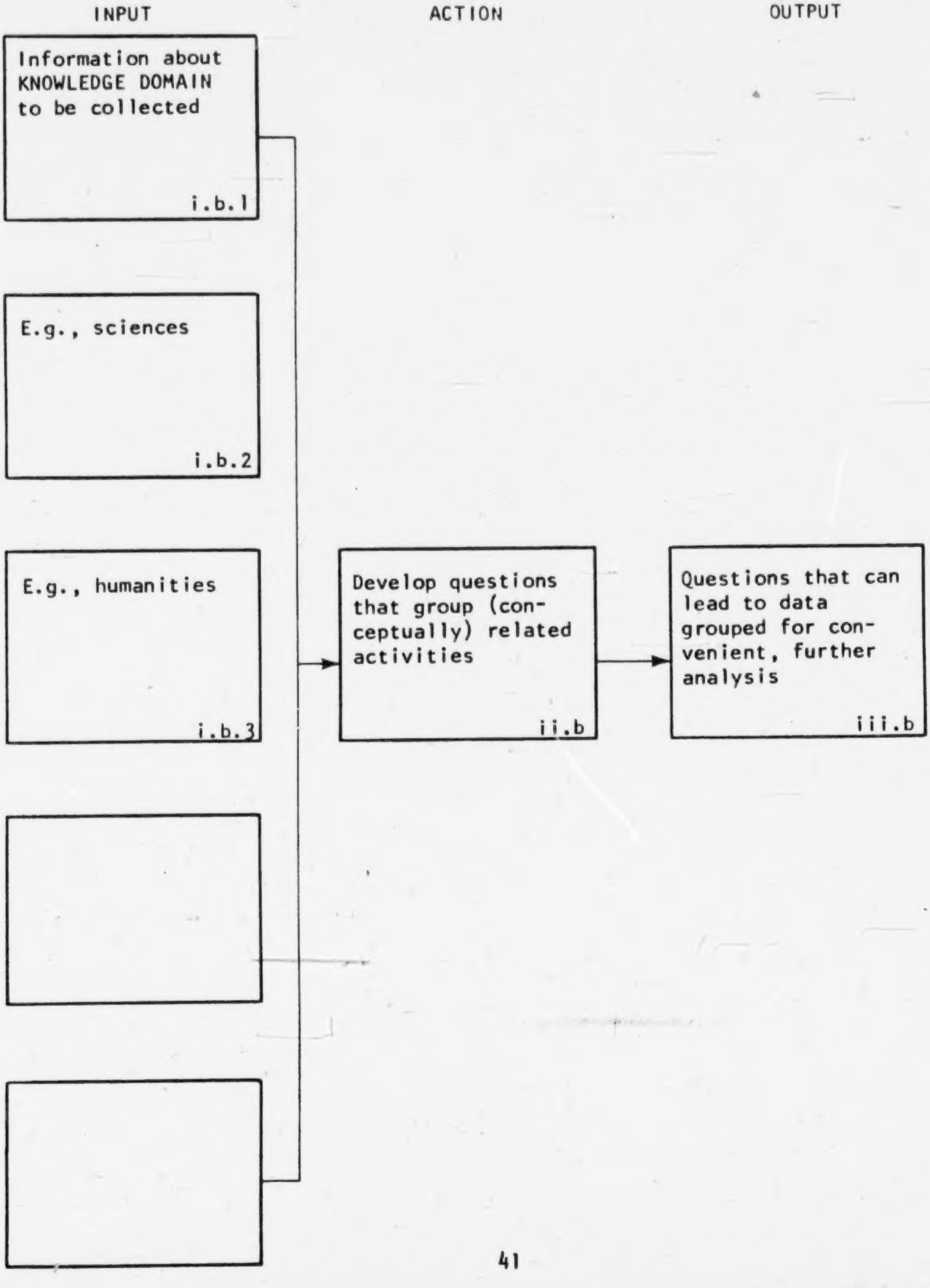
MORE DETAILED DIAGRAM FOR GENERALIZATIONS


INPUT
ACTION
OUTPUT
Information about PERFORMANCE to be collected
i.a.1
Information about GENERAL COGNITIVE SKILLS to be collected
i.a.2
Information about SOCIAL BEHAVIOR to be collected
i.a.3
Develop questions that permit the description of activities in the order in which they occur
ii.a
Questions that can lead to data which describe the flow of activities
iii.a

from

step	5.1
cell	i.b
page	39

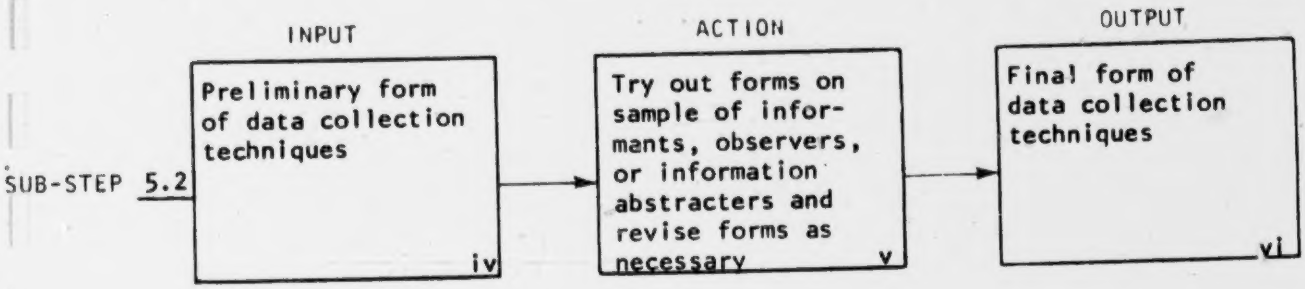
MORE DETAILED DIAGRAM FOR GENERALIZATIONS


INPUT
ACTION
OUTPUT
Information about KNOWLEDGE DOMAIN to be collected
i.b.1
E.g., sciences
i.b.2
E.g., humanities
i.b.3
Develop questions that group (conceptually) related activities
ii.b
Questions that can lead to data grouped for convenient, further analysis
iii.b

from

step	5.2
cell	
page	32

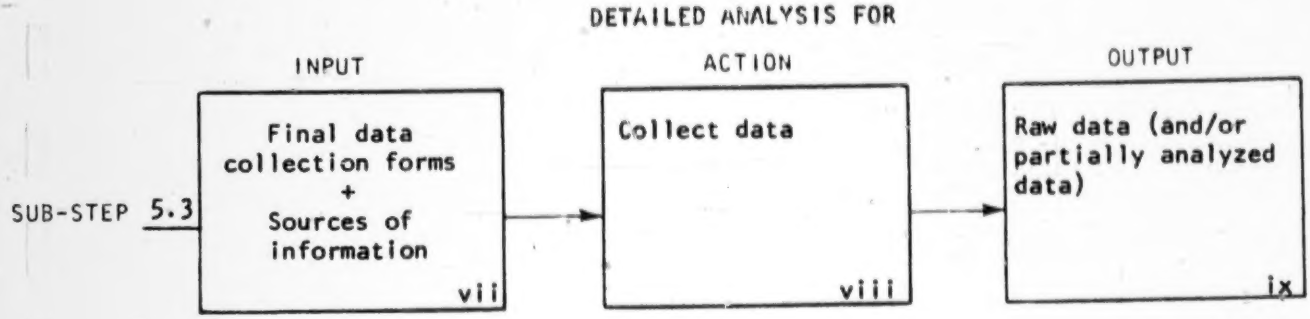
NO DETAILED ANALYSIS PROVIDED


INPUT
ACTION
OUTPUT
SUB-STEP 5.2
Preliminary form of data collection techniques
iv
Try out forms on sample of informants, observers, or information abstracters and revise forms as necessary
v
Final form of data collection techniques
vi

from

step	5.3
cell	
page	32

DETAILED ANALYSIS FOR

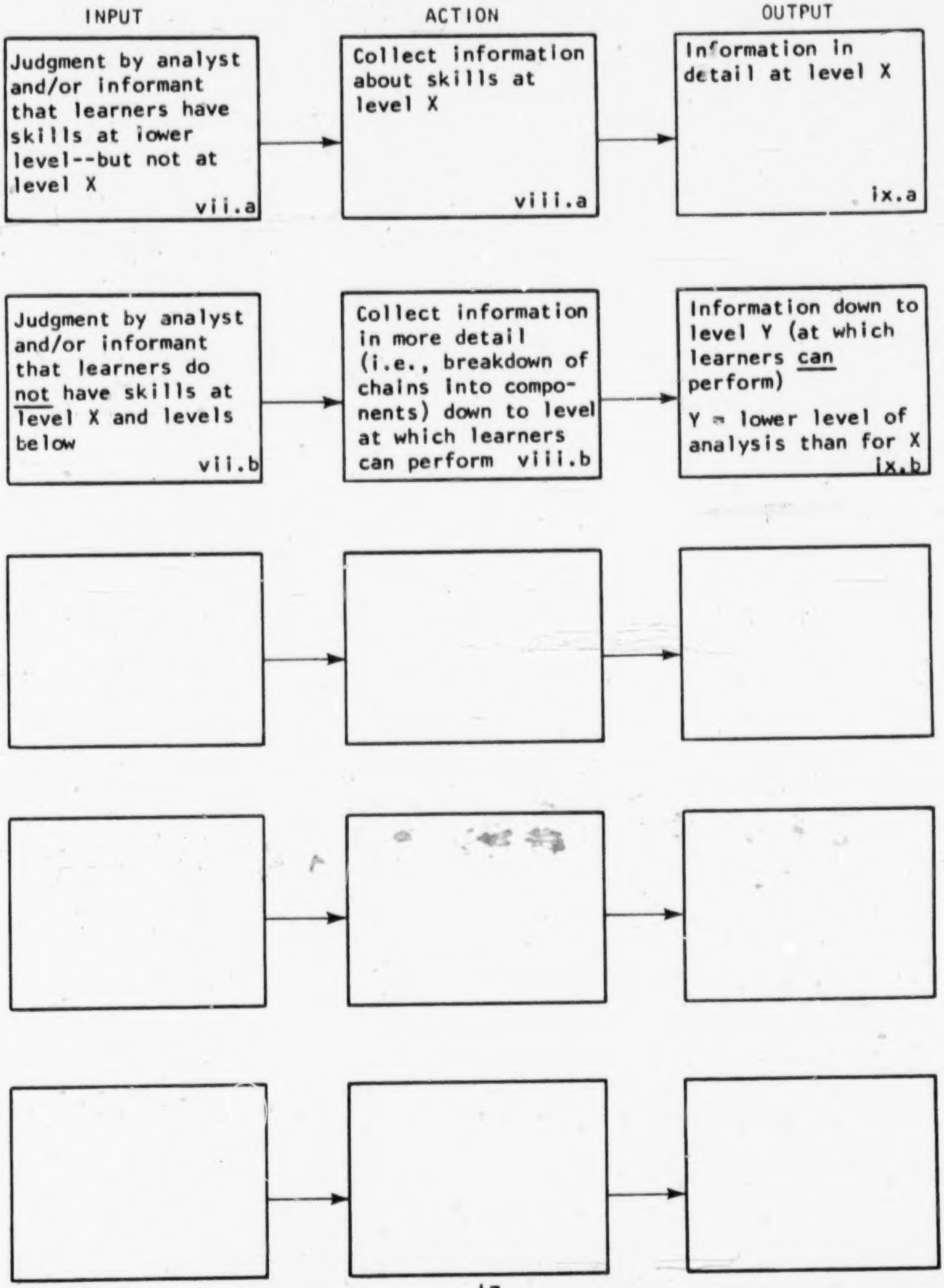

INPUT
ACTION
OUTPUT
SUB-STEP 5.3
Final data collection forms + Sources of information
vii
Collect data
viii
Raw data (and/or partially analyzed data)
ix

ON NEXT 1 PAGE

from

step	5.3
cell	vii
page	32

MORE DETAILED DIAGRAM FOR DISCRIMINATIONS



Judgment by analyst and/or informant that learners have skills at lower level--but not at level X vii.a

Collect information about skills at level X viii.a

Information in detail at level X ix.a

Judgment by analyst and/or informant that learners do not have skills at level X and levels below vii.b

Collect information in more detail (i.e., breakdown of chains into components) down to level at which learners can perform viii.b

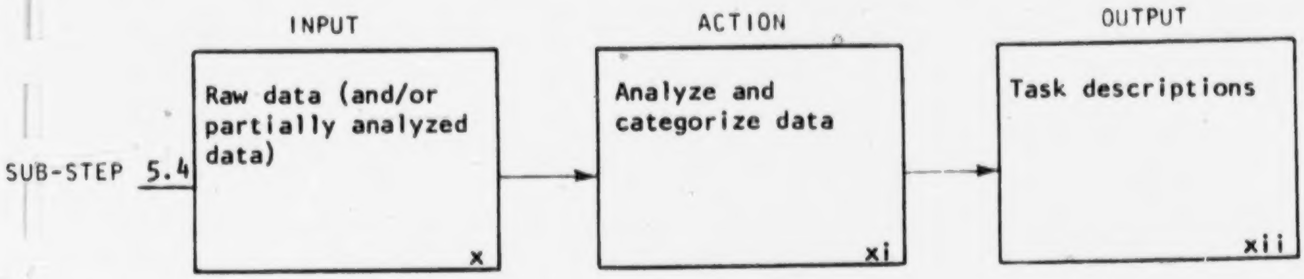
Information down to level Y (at which learners can perform)

Y = lower level of analysis than for X ix.b

from

step	5.4
cell	
page	32

DETAILED ANALYSIS FOR

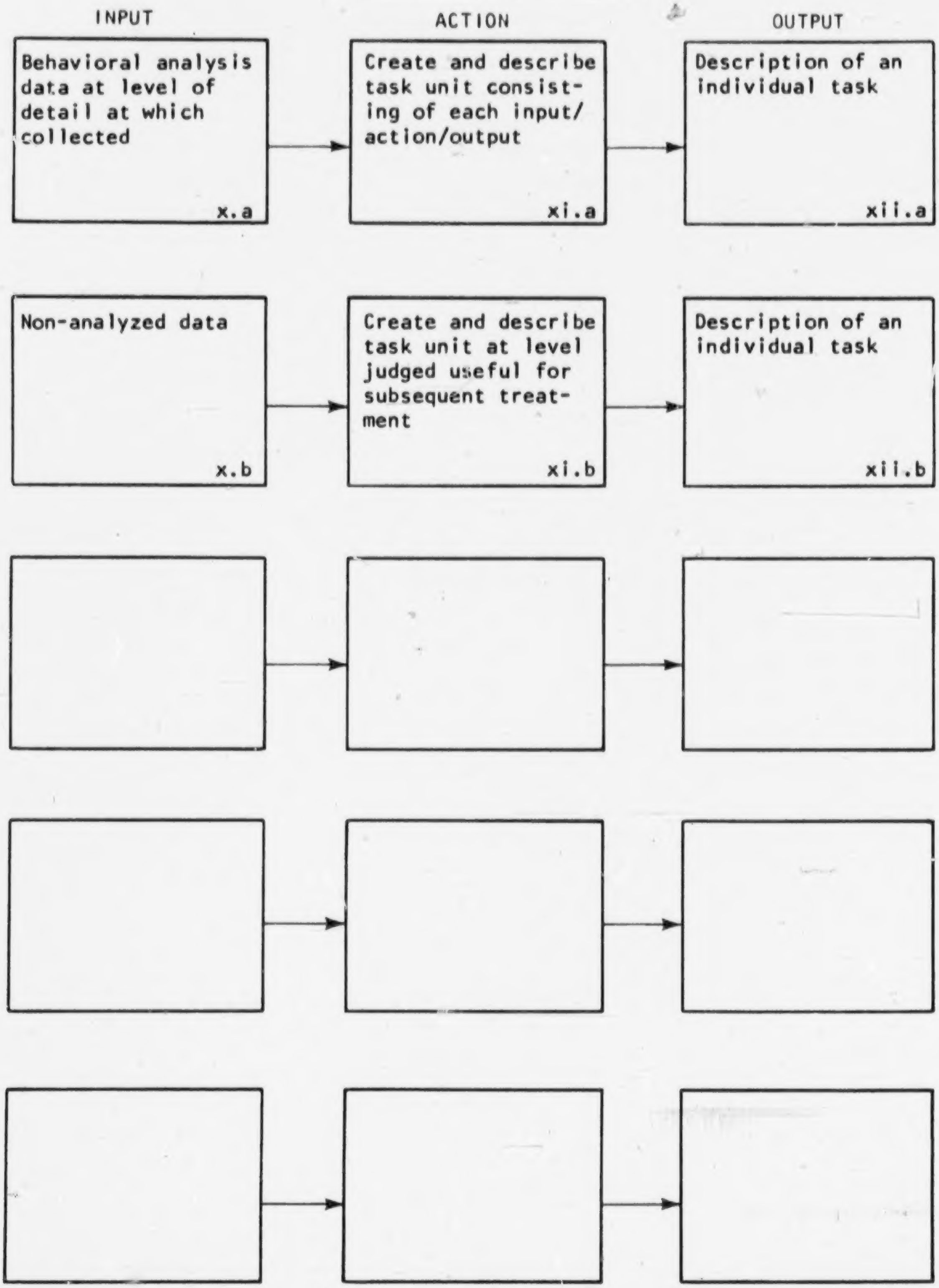

INPUT
ACTION
OUTPUT
SUB-STEP 5.4
Raw data (and/or partially analyzed data)
x
Analyze and categorize data
xi
Task descriptions
xii

ON NEXT 2 PAGES

from

step	5.4
cell	x
page	32

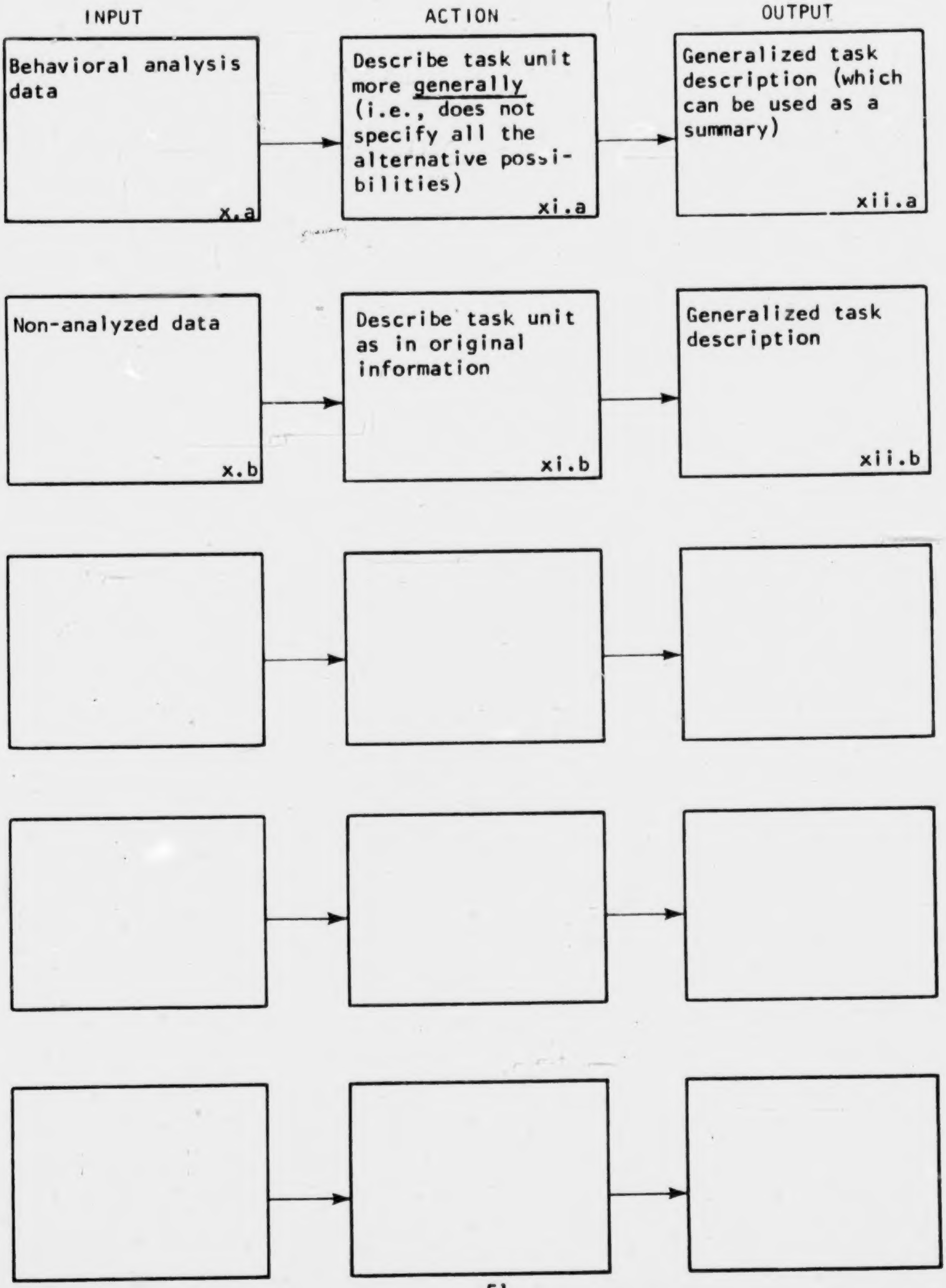
MORE DETAILED DIAGRAM FOR DISCRIMINATIONS (1)


INPUT
ACTION
OUTPUT
Behavioral analysis data at level of detail at which collected
x.a
Create and describe task unit consisting of each input/action/output
xi.a
Description of an individual task
xii.a
Non-analyzed data
x.b
Create and describe task unit at level judged useful for subsequent treatment
xi.b
Description of an individual task
xii.b

from

step	5.4
cell	x
page	32

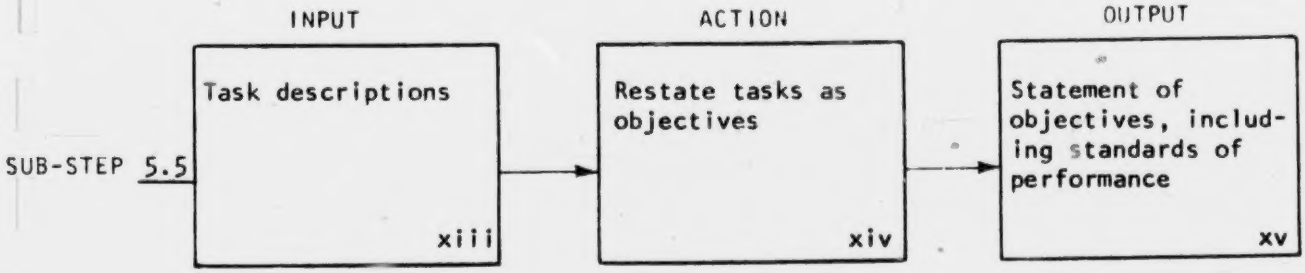
MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS (2)


INPUT
ACTION
OUTPUT
Behavioral analysis data
x.a
Describe task unit more generally (i.e., does not specify all the alternative possibilities)
xi.a
Generalized task description (which can be used as a summary)
xii.a
Non-analyzed data
x.b
Describe task unit as in original information
xi.b
Generalized task description
xii.b

from

step	5.5
cell	xiii
page	32

DETAILED ANALYSIS FOR

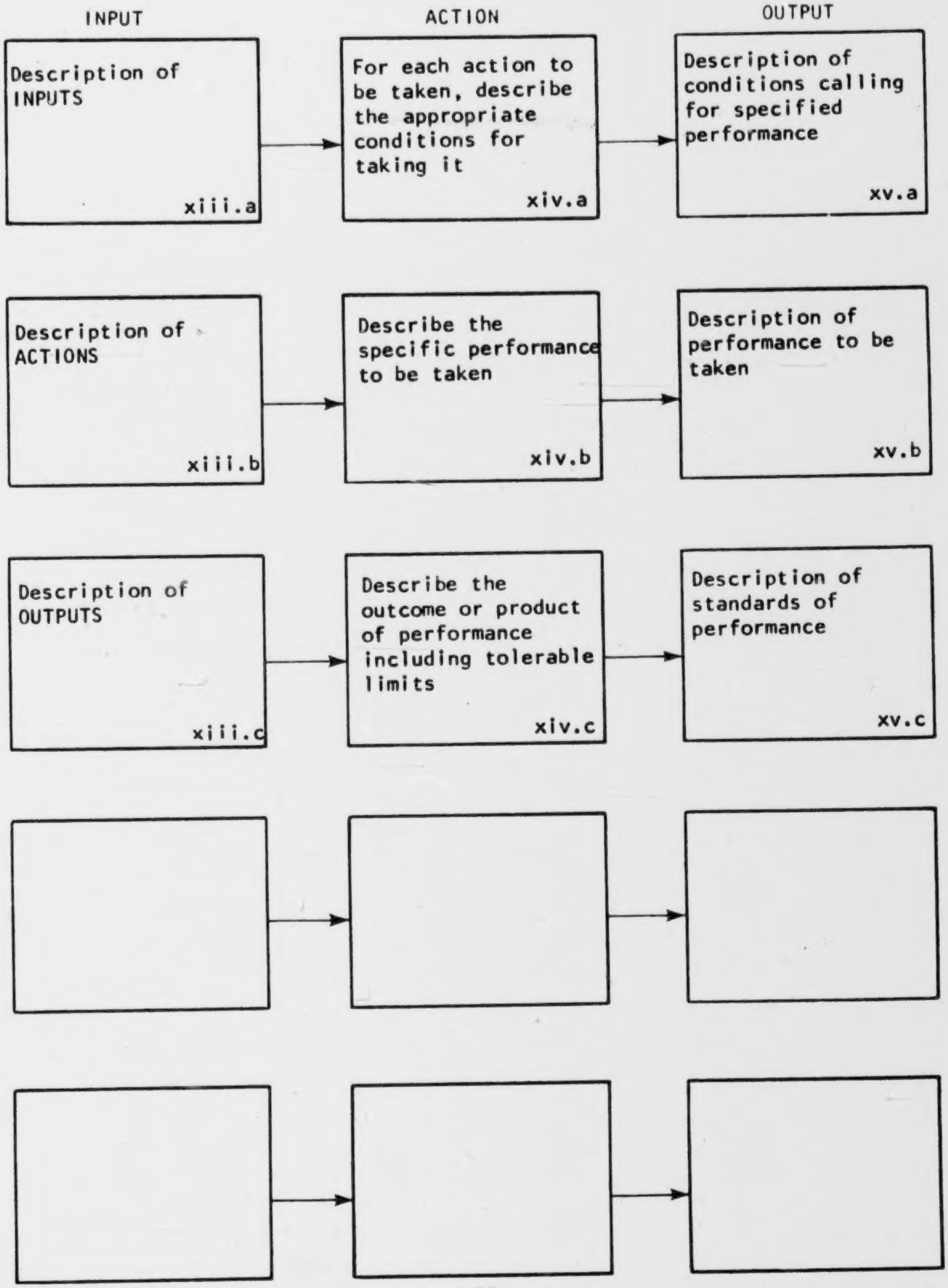

INPUT
ACTION
OUTPUT
SUB-STEP 5.5
Task descriptions
xiii
Restate tasks as objectives
xiv
Statement of objectives, including standards of performance
xv

ON NEXT 1 PAGE

from

step	5.5
cell	xiii
page	32

MORE DETAILED DIAGRAM FOR DISCRIMINATIONS



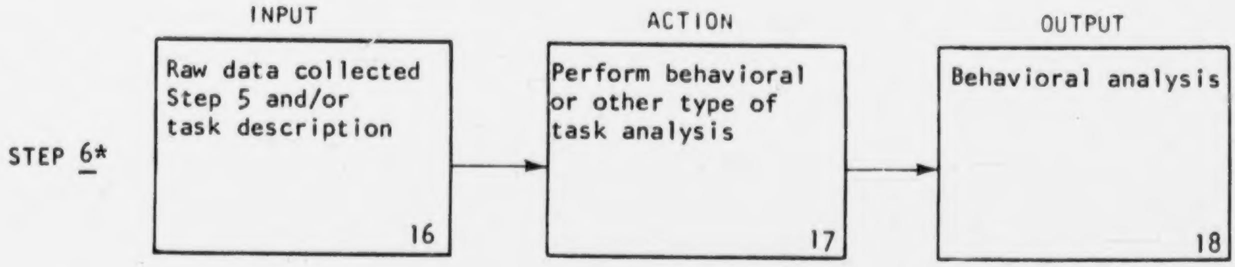
INPUT	ACTION	OUTPUT
Description of INPUTS xiii.a	For each action to be taken, describe the appropriate conditions for taking it xiv.a	Description of conditions calling for specified performance xv.a
Description of ACTIONS xiii.b	Describe the specific performance to be taken xiv.b	Description of performance to be taken xv.b
Description of OUTPUTS xiii.c	Describe the outcome or product of performance including tolerable limits xiv.c	Description of standards of performance xv.c

FOLD BACK
PAGE 31.

from

step	6
cell	
page	1

DETAILED ANALYSIS FOR


INPUT
ACTION
OUTPUT
STEP 6*
Raw data collected Step 5 and/or task description
16
Perform behavioral or other type of task analysis
17
Behavioral analysis
18

ON NEXT 13 PAGES

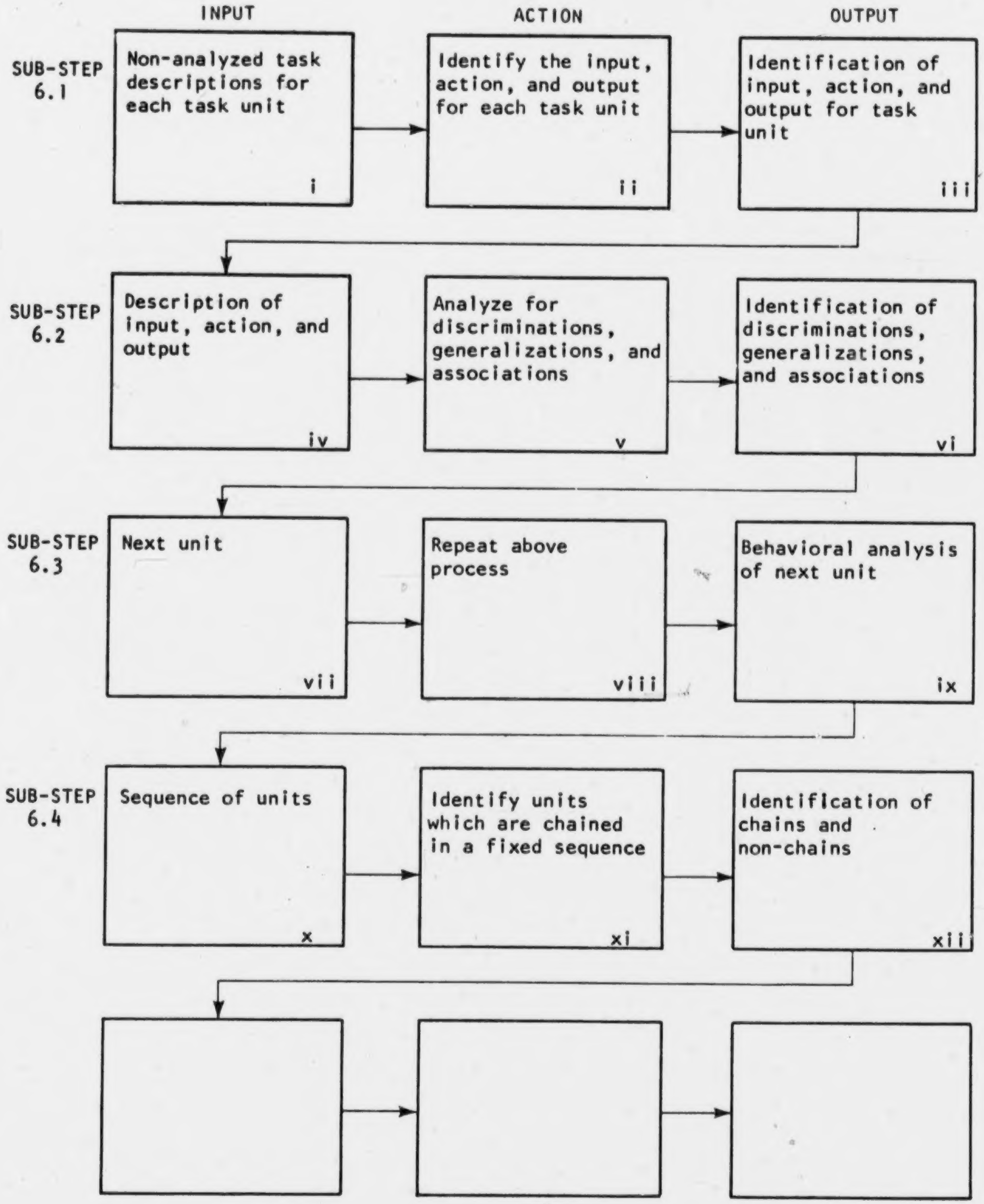
FOLD OUT THIS PAGE.

*Behavioral analysis can be performed as data are collected or from task descriptions. Preferably, it should be performed as data are being collected and then "perfected" later on. The type of analysis performed is presented here in Step 6, although according to the above recommendation, means for carrying it out should be built into the data collection instruments (Step 5).

from

step	6
cell	
page	1

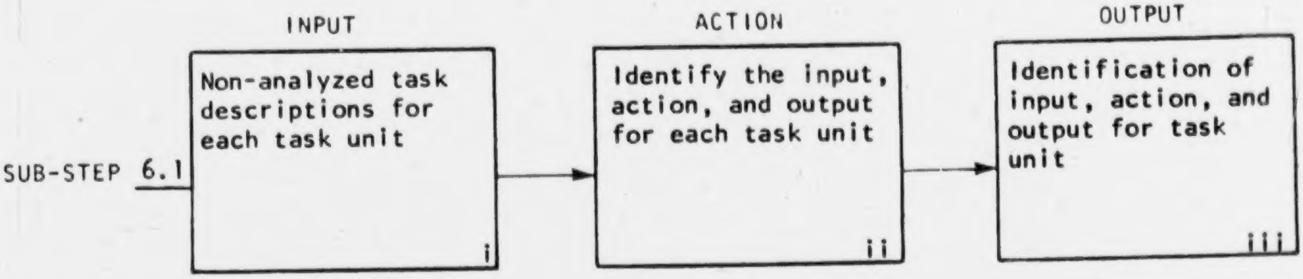
MORE DETAILED DIAGRAM FOR CHAINS


INPUT
ACTION
OUTPUT
SUB-STEP 6.1
Non-analyzed task descriptions for each task unit
i
Identify the input, action, and output for each task unit
ii
Identification of input, action, and output for task unit
iii
SUB-STEP 6.2
Description of input, action, and output
iv
Analyze for discriminations, generalizations, and associations
v
Identification of discriminations, generalizations, and associations
vi
SUB-STEP 6.3
Next unit
vii
Repeat above process
viii
Behavioral analysis of next unit
ix
SUB-STEP 6.4
Sequence of units
x
Identify units which are chained in a fixed sequence
xi
Identification of chains and non-chains
xii

from

step	6.1
cell	
page	58

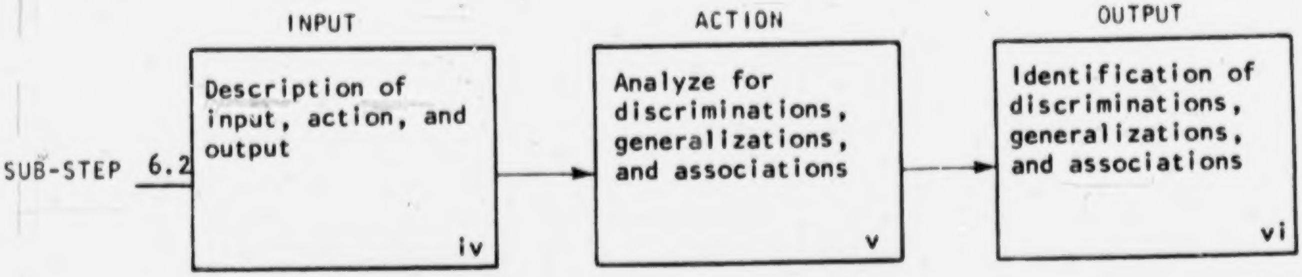
NO DETAILED ANALYSIS FOR


INPUT
ACTION
OUTPUT
SUB-STEP 6.1
Non-analyzed task descriptions for each task unit
i
Identify the input, action, and output for each task unit
ii
Identification of input, action, and output for task unit
iii

from

step	6.2
cell	
page	58

DETAILED ANALYSIS FOR


SUB-STEP 6.2
INPUT
Description of input, action, and output
iv
ACTION
Analyze for discriminations, generalizations, and associations
v
OUTPUT
Identification of discriminations, generalizations, and associations
vi

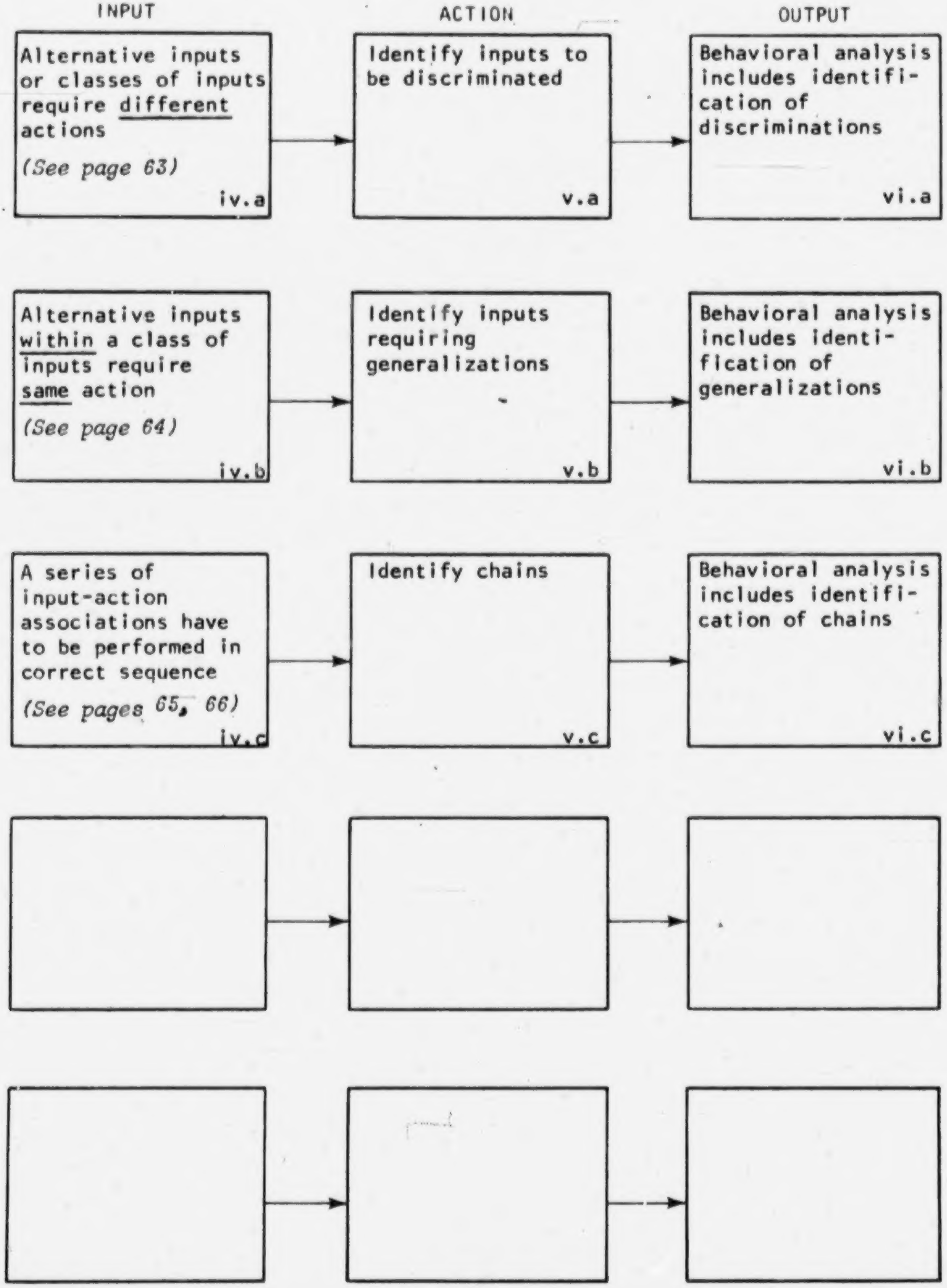
ON NEXT 5 PAGES

from

step	6.2
cell	iv
page	58

MORE DETAILED DIAGRAM FOR DISCRIMINATIONS

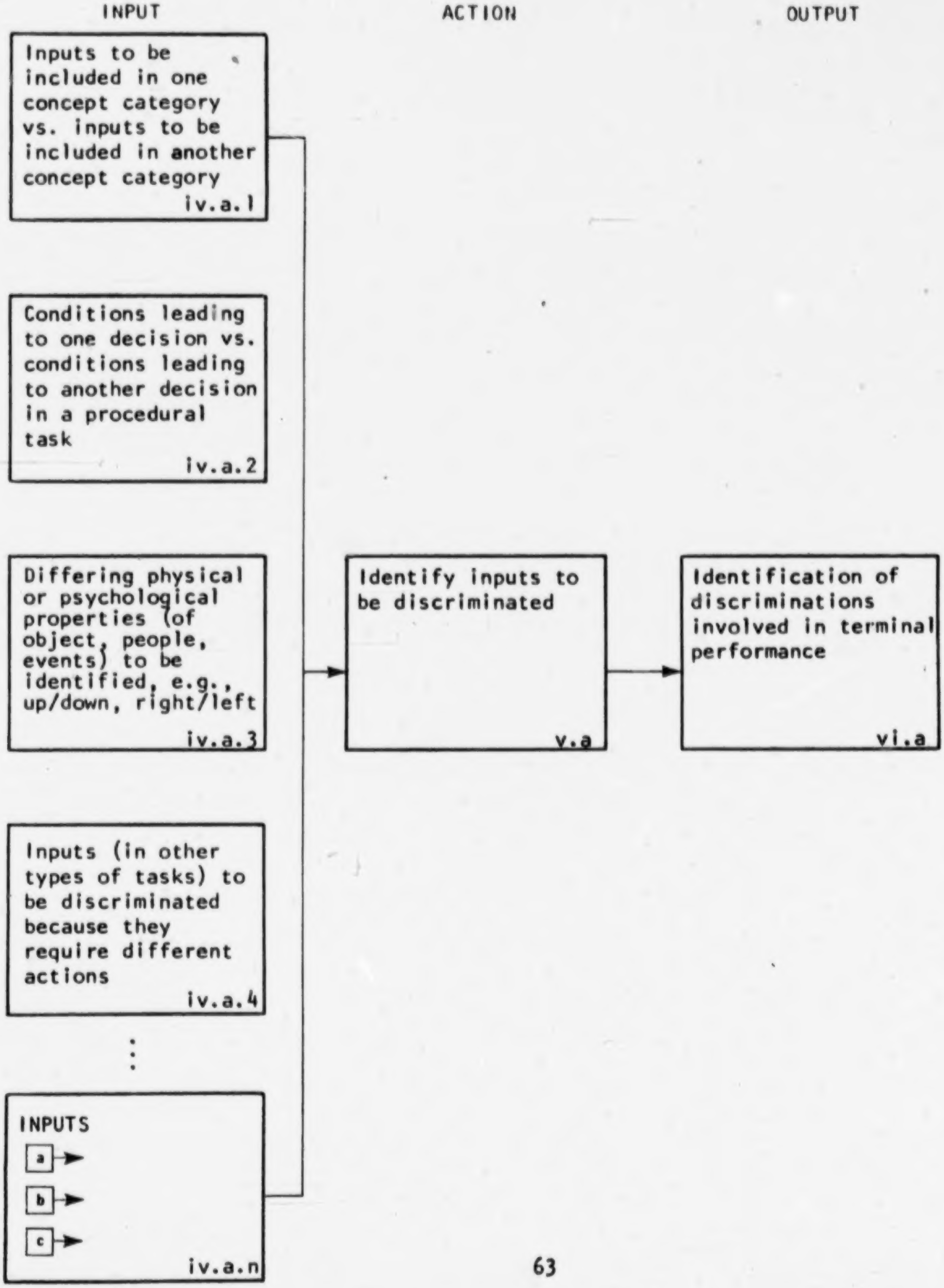
STEP 6


INPUT
ACTION
OUTPUT
Alternative inputs or classes of inputs require different actions
(See page 63)
iv.a
Identify inputs to be discriminated
v.a
Behavioral analysis includes identification of discriminations
vi.a
Alternative inputs within a class of inputs require same action
(See page 64)
iv.b
Identify inputs requiring generalizations
v.b
Behavioral analysis includes identification of generalizations
vi.b
A series of input-action associations have to be performed in correct sequence
(See pages 65, 66)
iv.c
Identify chains
v.c
Behavioral analysis includes identification of chains
vi.c

from

step	6.2
cell	iv.a
page	62

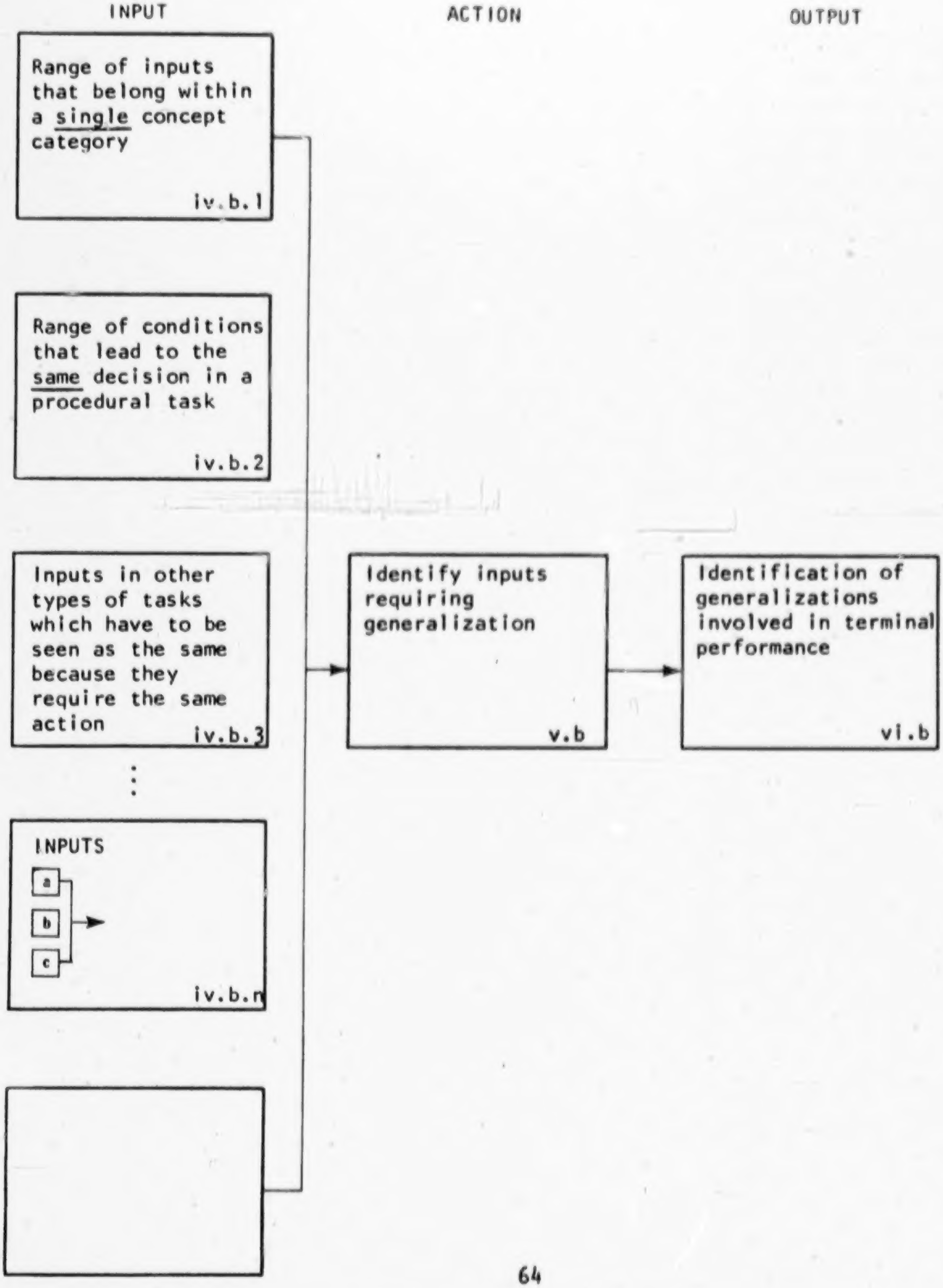
MORE DETAILED DIAGRAM FOR GENERALIZATIONS


INPUT
ACTION
OUTPUT
Inputs to be included in one concept category vs. inputs to be included in another concept category
iv.a.1
Conditions leading to one decision vs. conditions leading to another decision in a procedural task
iv.a.2
Differing physical or psychological properties (of object, people, events) to be identified, e.g., up/down, right/left
iv.a.3
Inputs (in other types of tasks) to be discriminated because they require different actions
iv.a.4
INPUTS
a
b
c
iv.a.n
Identify inputs to be discriminated
v.a
Identification of discriminations involved in terminal performance
vi.a

from

step	6.2
cell	iv.b
page	62

MORE DETAILED DIAGRAM FOR GENERALIZATIONS


INPUT
ACTION
OUTPUT
iv.b.1
iv.b.2
iv.b.3
INPUTS
a
b
c
iv.b.n
v.b
vi.b

Range of inputs that belong within a single concept category

Range of conditions that lead to the same decision in a procedural task

Inputs in other types of tasks which have to be seen as the same because they require the same action

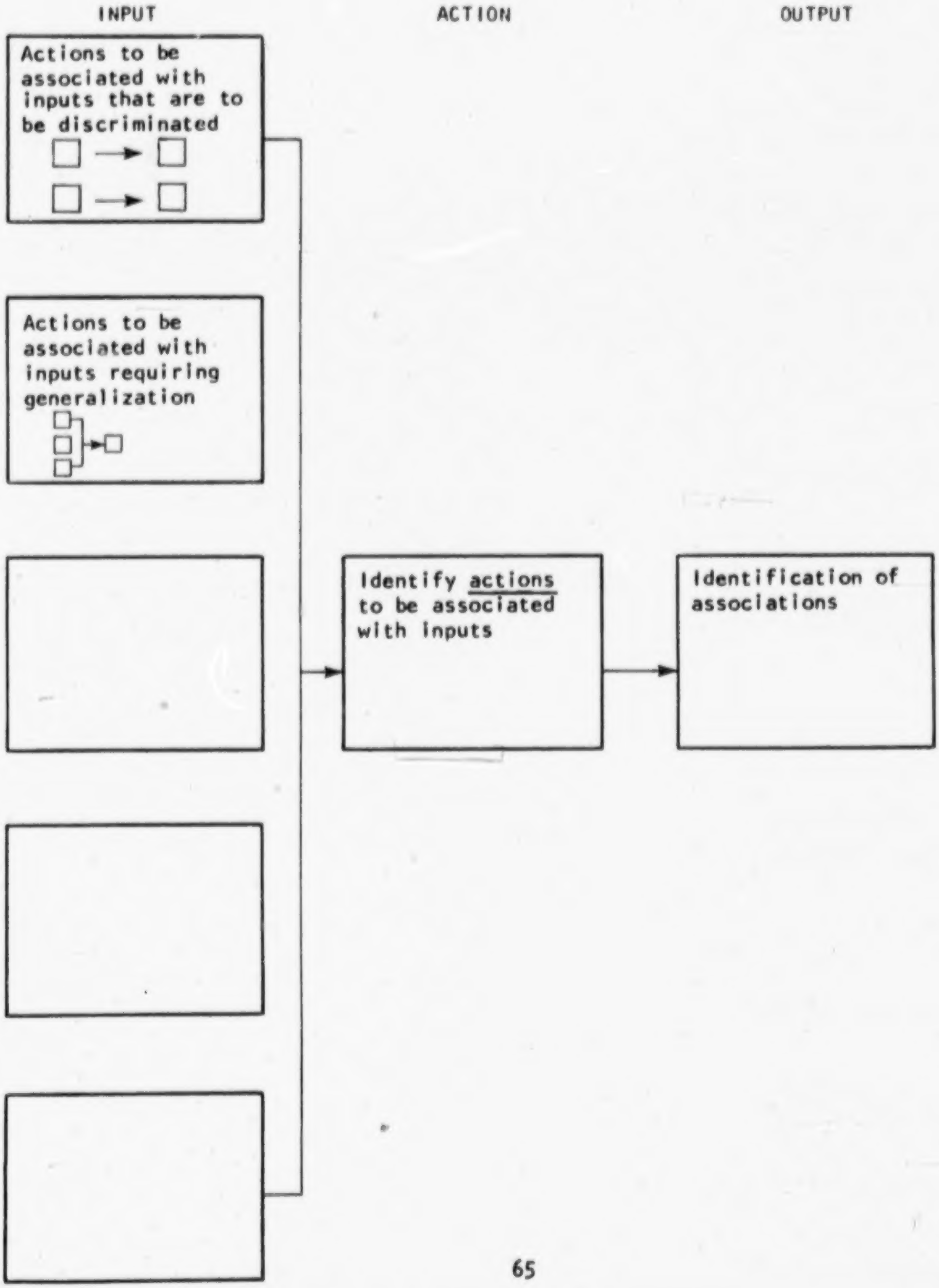
Identify inputs requiring generalization

Identification of generalizations involved in terminal performance

from

step	
cell	
page	

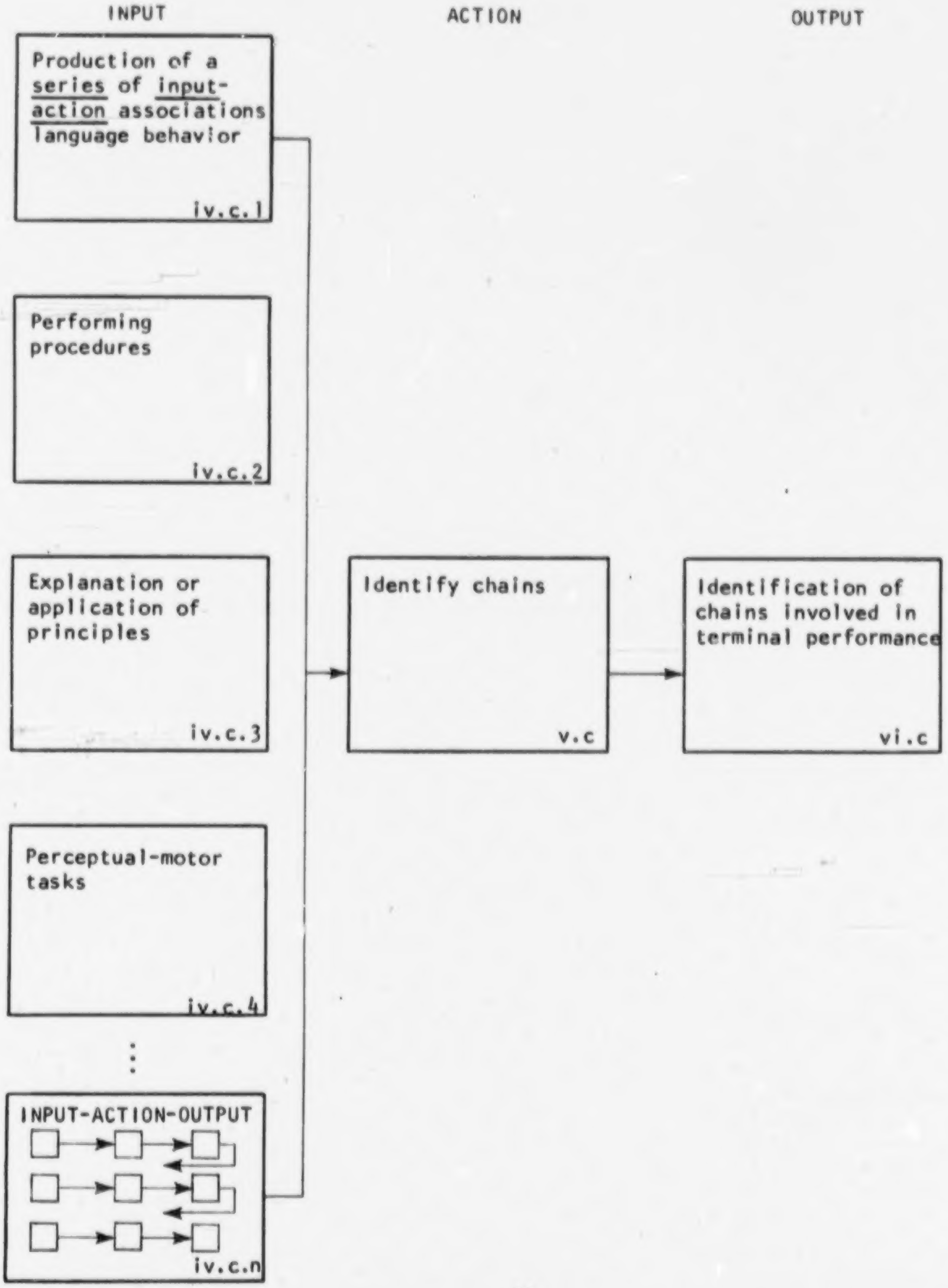
MORE DETAILED DIAGRAM FOR GENERALIZATIONS


INPUT
ACTION
OUTPUT
Actions to be associated with inputs that are to be discriminated
Actions to be associated with inputs requiring generalization
Identify actions to be associated with inputs
Identification of associations

from

step	
cell	
page	

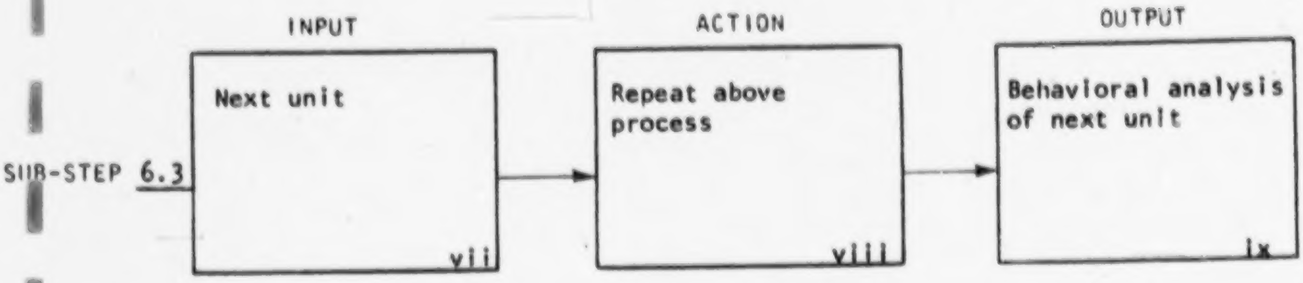
MORE DETAILED DIAGRAM FOR GENERALIZATIONS


INPUT
ACTION
OUTPUT
Production of a series of input-action associations language behavior
iv.c.1
Performing procedures
iv.c.2
Explanation or application of principles
iv.c.3
Perceptual-motor tasks
iv.c.4
INPUT-ACTION-OUTPUT
iv.c.n
Identify chains
v.c
Identification of chains involved in terminal performance
vi.c

from

step	6.3
cell	
page	58

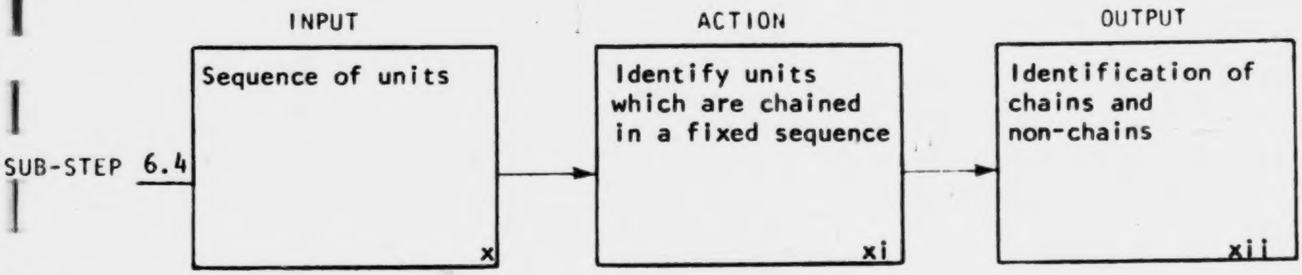
NO DETAILED ANALYSIS
SEE SUB-STEP 6.2


INPUT
ACTION
OUTPUT
SUB-STEP 6.3
Next unit
vii
Repeat above process
viii
Behavioral analysis of next unit
ix

from

step	6.4
cell	
page	58

NO DETAILED ANALYSIS
SEE SUB-STEP 6.2

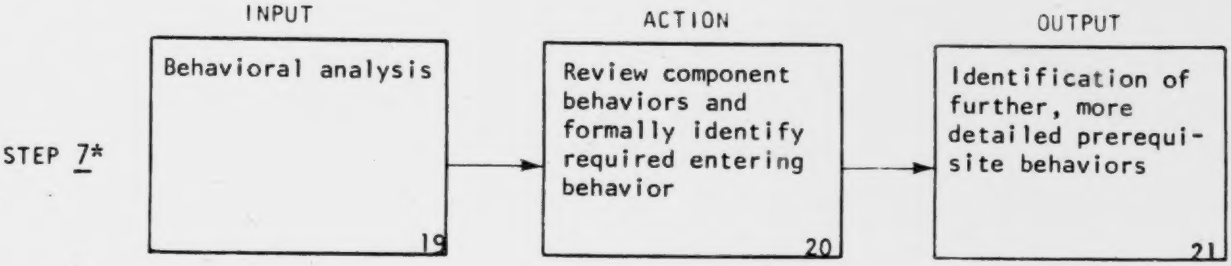

INPUT
ACTION
OUTPUT
SUB-STEP 6.4
Sequence of units
x
Identify units which are chained in a fixed sequence
xi
Identification of chains and non-chains
xii

FOLD BACK
PAGE 57.

from

step	7
cell	
page	2

DETAILED ANALYSIS FOR


INPUT
ACTION
OUTPUT
STEP 7*
Behavioral analysis
19
Review component behaviors and formally identify required entering behavior
20
Identification of further, more detailed prerequisite behaviors
21

ON NEXT __ PAGES

FOLD OUT THIS PAGE.

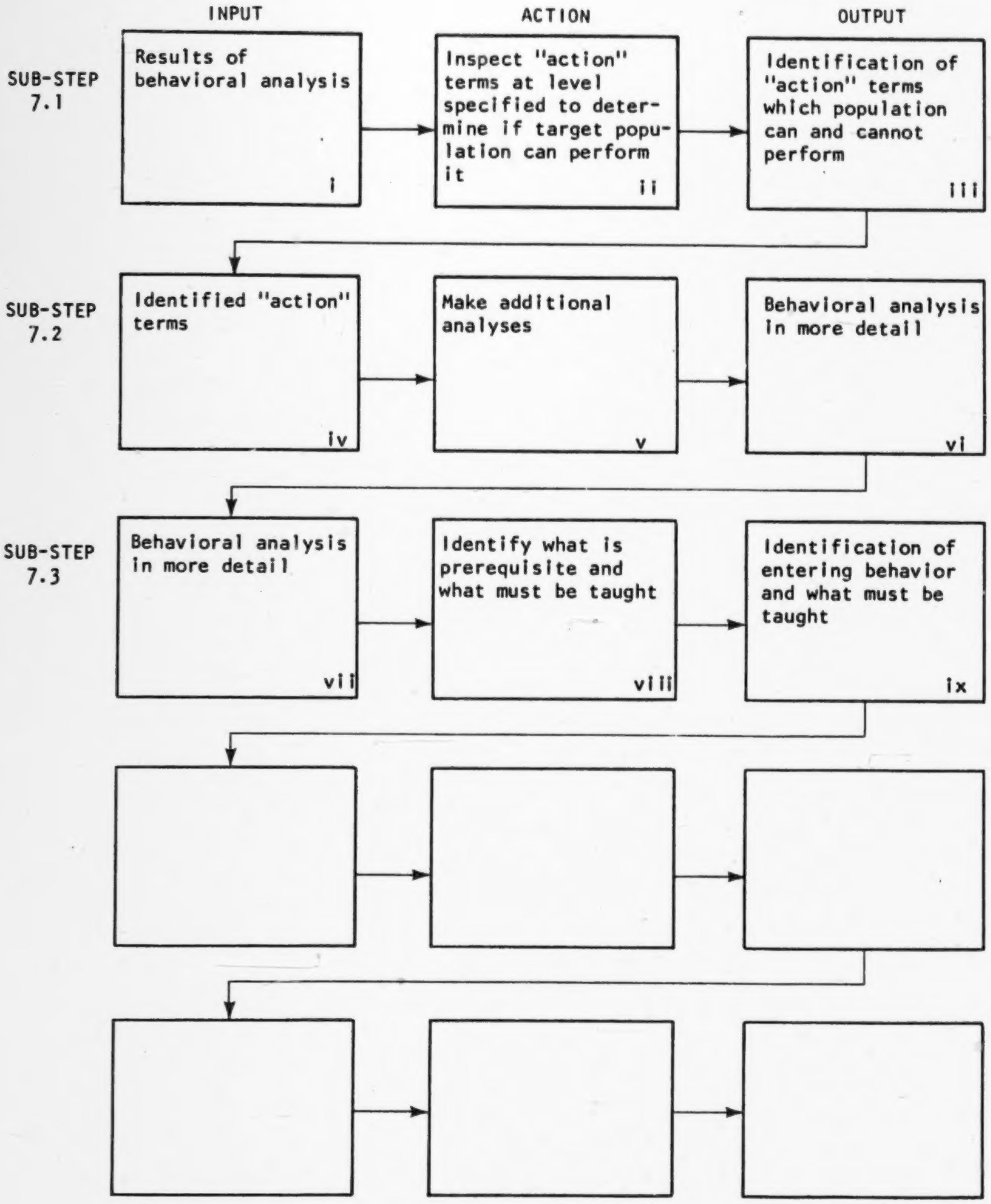
*Ideally, behavioral analysis data is collected and reported at a level of detail that identifies the skills that must be taught. More detail (i.e., a lower, more specific level of detail) is not provided because it is assumed that the target population can already perform at these lower levels.

If the appropriate level of detail has not been identified, it is necessary to do so at this point. Even if it has been identified, it is appropriate to have the judgment reviewed and more detail added if necessary. This is done in Step 7.

from

step	7
cell	
page	2

MORE DETAILED DIAGRAM FOR CHAINS

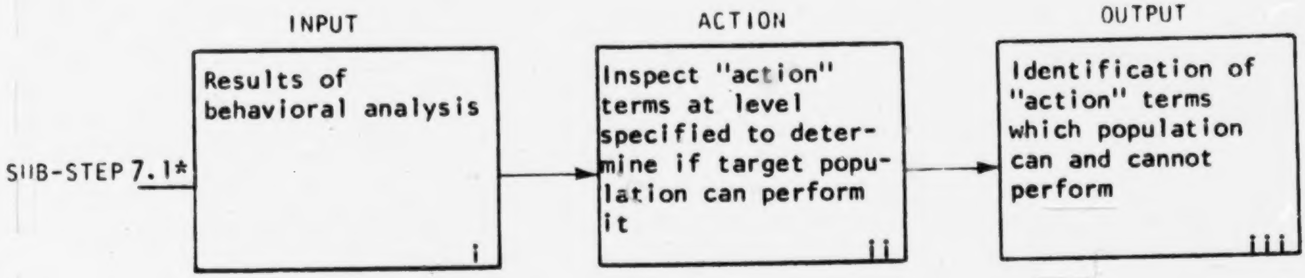


	INPUT	ACTION	OUTPUT
SUB-STEP 7.1	Results of behavioral analysis i	Inspect "action" terms at level specified to determine if target population can perform it ii	Identification of "action" terms which population can and cannot perform iii
SUB-STEP 7.2	Identified "action" terms iv	Make additional analyses v	Behavioral analysis in more detail vi
SUB-STEP 7.3	Behavioral analysis in more detail vii	Identify what is prerequisite and what must be taught viii	Identification of entering behavior and what must be taught ix

from

step	7.1
cell	i
page	72

DETAILED ANALYSIS FOR


INPUT
ACTION
OUTPUT
Results of behavioral analysis
i
Inspect "action" terms at level specified to determine if target population can perform it
ii
Identification of "action" terms which population can and cannot perform
iii
SUB-STEP 7.1*

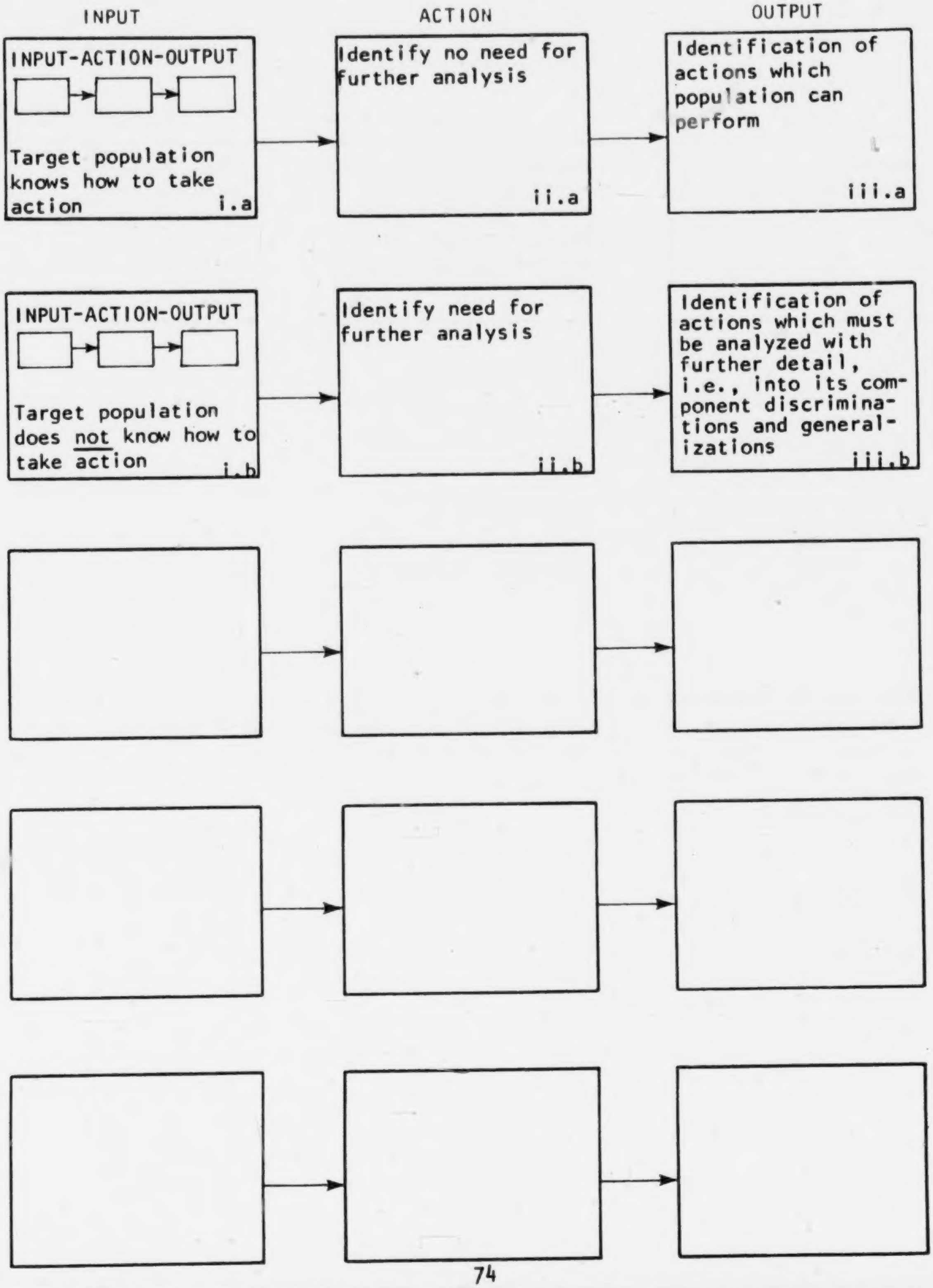
ON NEXT 1 PAGE

*In this approach, it is assumed that the actions to be associated with inputs are never taught. All that is taught are the component discriminations and generalizations (and the chaining of steps or sub-steps). Thus, how to take an action is not taught.

from

step	7.1
cell	i
page	72

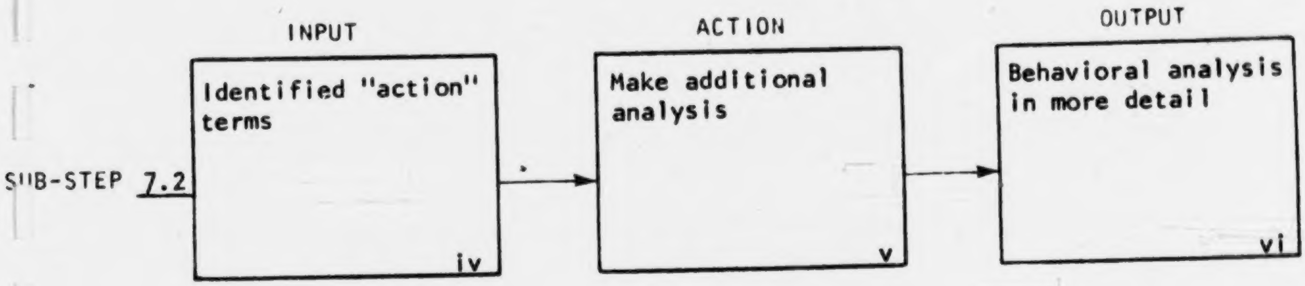
MORE DETAILED DIAGRAM FOR DISCRIMINATIONS


INPUT
ACTION
OUTPUT
INPUT-ACTION-OUTPUT
Target population knows how to take action
i.a
Identify no need for further analysis
ii.a
Identification of actions which population can perform
iii.a
INPUT-ACTION-OUTPUT
Target population does not know how to take action
i.b
Identify need for further analysis
ii.b
Identification of actions which must be analyzed with further detail, i.e., into its component discriminations and generalizations
iii.b

from

step	7.2
cell	
page	72

DETAILED ANALYSIS FOR

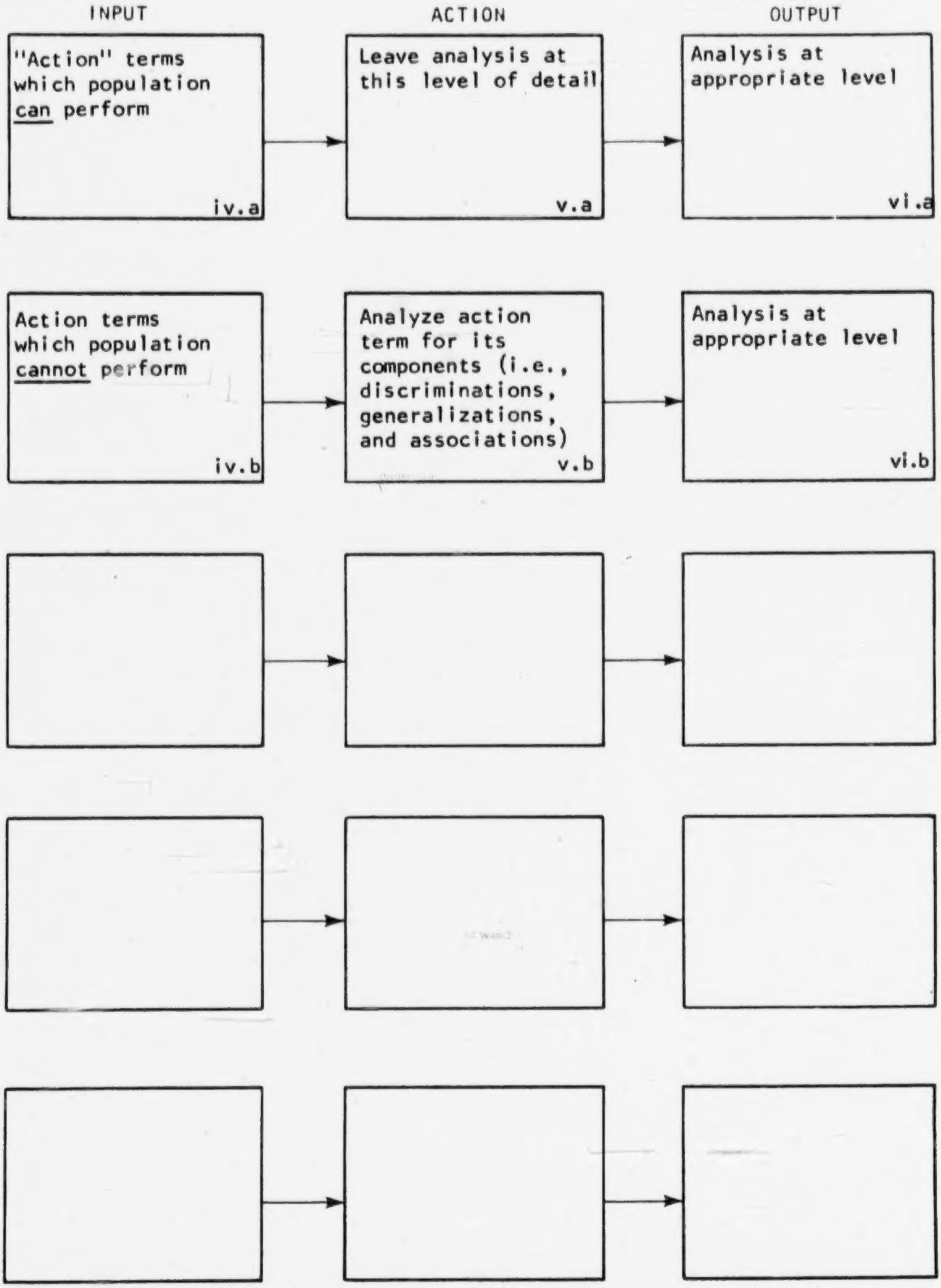

INPUT
ACTION
OUTPUT
SUB-STEP 7.2
Identified "action" terms
iv
Make additional analysis
v
Behavioral analysis in more detail
vi

ON NEXT 1 PAGE

from

step	7.2
cell	iv
page	72

MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS

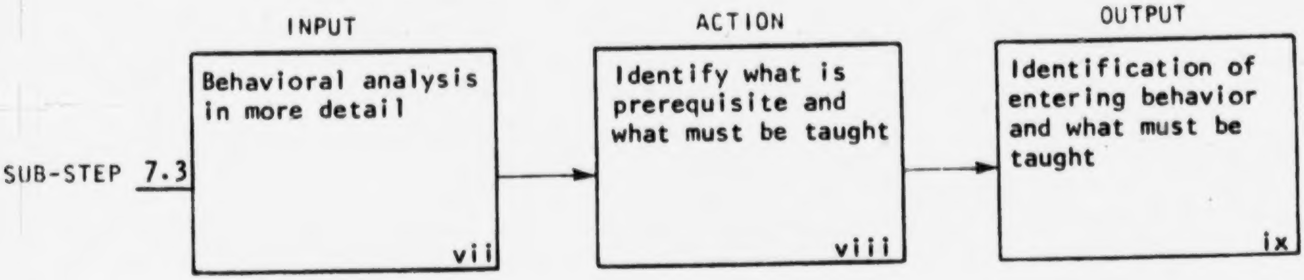


INPUT	ACTION	OUTPUT
"Action" terms which population can perform iv.a	Leave analysis at this level of detail v.a	Analysis at appropriate level vi.a
Action terms which population cannot perform iv.b	Analyze action term for its components (i.e., discriminations, generalizations, and associations) v.b	Analysis at appropriate level vi.b

from

step	7.3
cell	
page	72

DETAILED ANALYSIS FOR

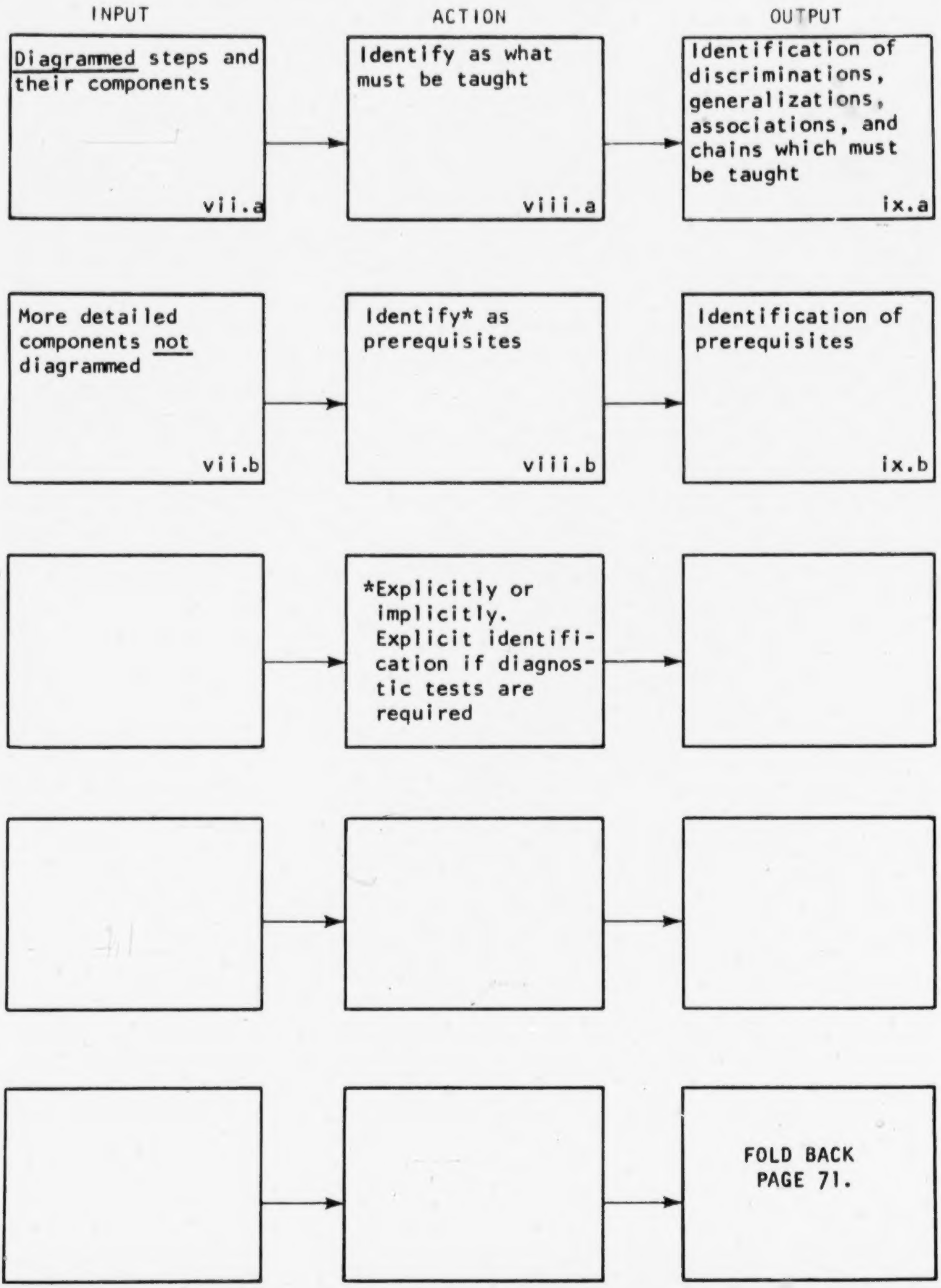

INPUT
ACTION
OUTPUT
SUB-STEP 7.3
Behavioral analysis in more detail
vii
Identify what is prerequisite and what must be taught
viii
Identification of entering behavior and what must be taught
ix

ON NEXT 1 PAGE

from

step	7.3
cell	vii
page	72

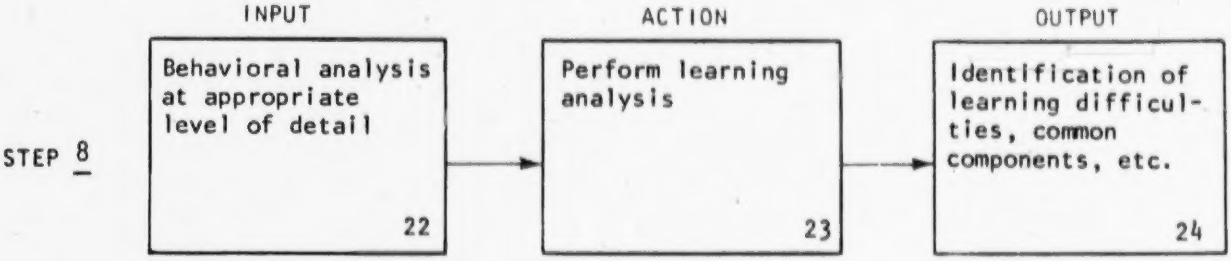
MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS


INPUT
ACTION
OUTPUT
Diagrammed steps and their components
vii.a
Identify as what must be taught
viii.a
Identification of discriminations, generalizations, associations, and chains which must be taught
ix.a
More detailed components not diagrammed
vii.b
Identify* as prerequisites
viii.b
Identification of prerequisites
ix.b
*Explicitly or implicitly. Explicit identification if diagnostic tests are required
FOLD BACK PAGE 71.

from

step	8
cell	
page	2

DETAILED ANALYSIS FOR


INPUT
ACTION
OUTPUT
STEP 8
Behavioral analysis at appropriate level of detail
22
Perform learning analysis
23
Identification of learning difficulties, common components, etc.
24

ON NEXT 10 PAGES

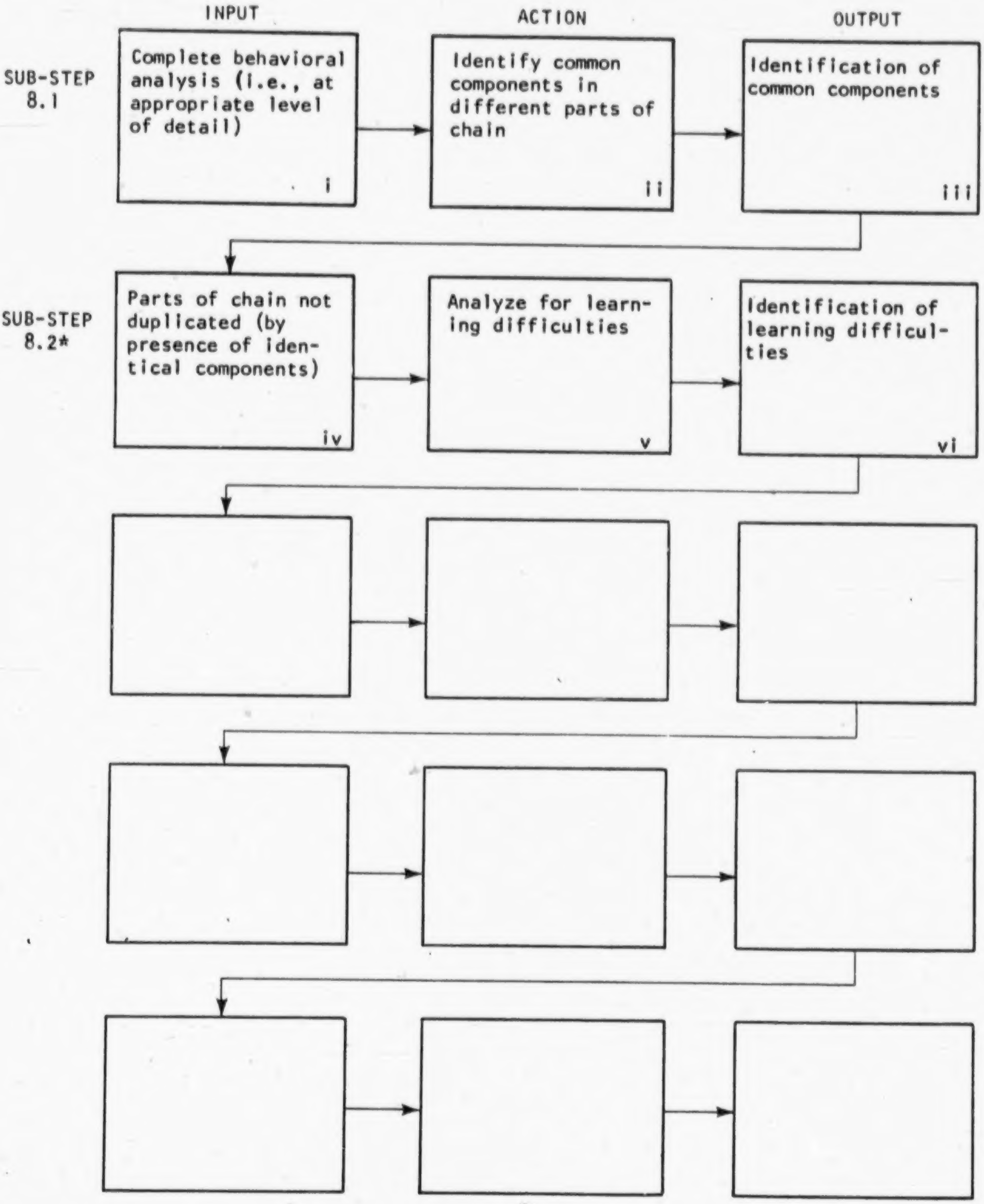
FOLD OUT THIS PAGE.

from

step	8
cell	
page	2

*Identification of learning difficulties and suggested ways to overcome them may be accomplished during the data collection stage of the development process. This is perhaps the ideal place to accomplish this step. If so done, Step 8 merely requires its completion and refinement.

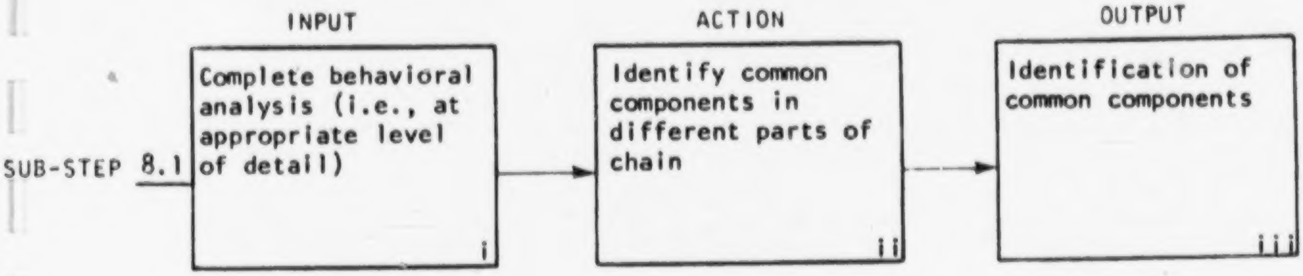
MORE DETAILED DIAGRAM FOR CHAINS



	INPUT	ACTION	OUTPUT
SUB-STEP 8.1	Complete behavioral analysis (i.e., at appropriate level of detail) i	Identify common components in different parts of chain ii	Identification of common components iii
SUB-STEP 8.2*	Parts of chain not duplicated (by presence of identical components) iv	Analyze for learning difficulties v	Identification of learning difficulties vi

from	
step	8.1
cell	
page	80

DETAILED ANALYSIS FOR

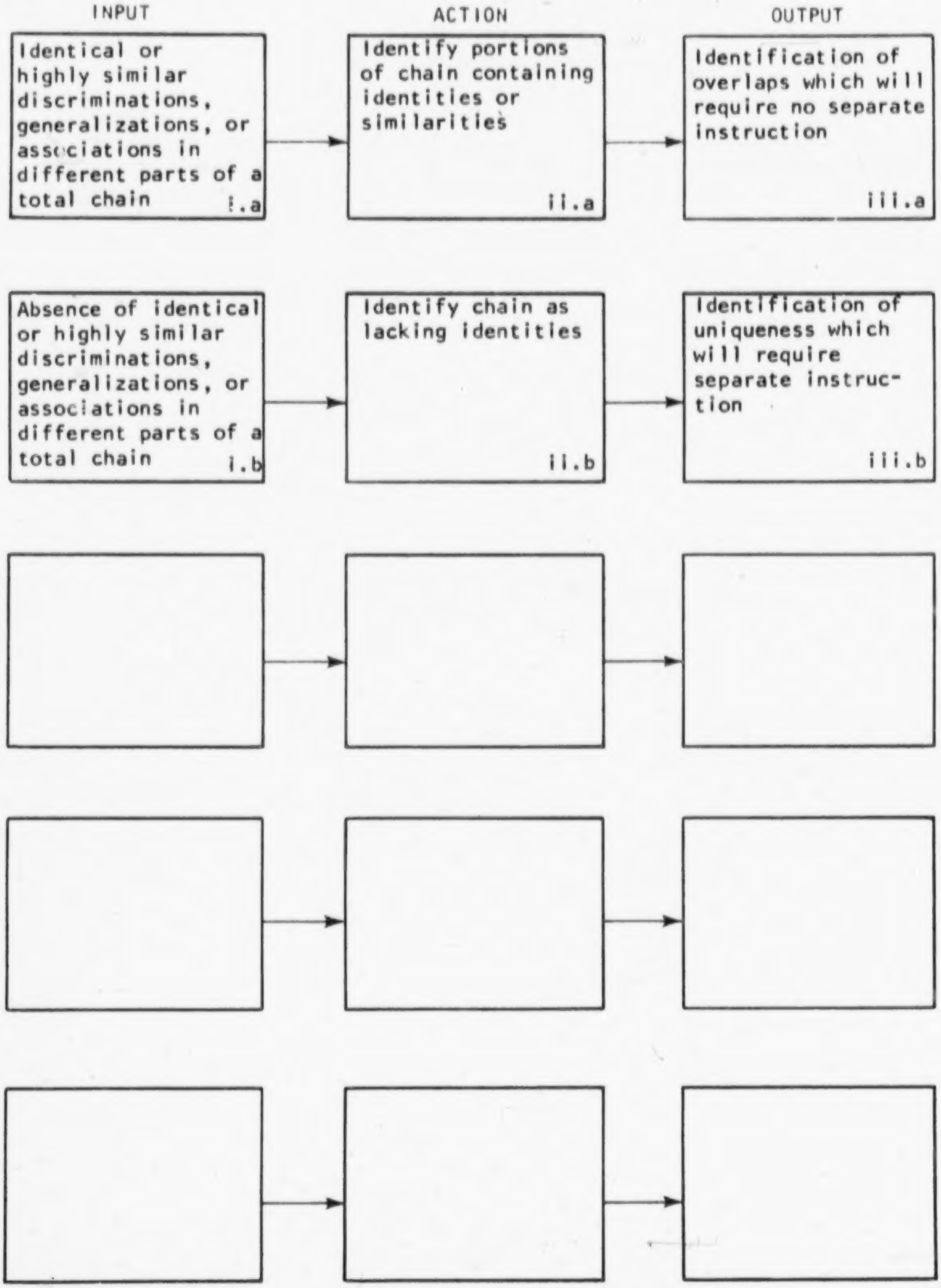

INPUT
ACTION
OUTPUT
SUB-STEP 8.1
Complete behavioral analysis (i.e., at appropriate level of detail)
i
Identify common components in different parts of chain
ii
Identification of common components
iii

ON NEXT 1 PAGE

from

step	8.1
cell	
page	80

MORE DETAILED DIAGRAM FOR DISCRIMINATIONS



INPUT

ACTION

OUTPUT

Identical or highly similar discriminations, generalizations, or associations in different parts of a total chain i.a

Identify portions of chain containing identities or similarities ii.a

Identification of overlaps which will require no separate instruction iii.a

Absence of identical or highly similar discriminations, generalizations, or associations in different parts of a total chain i.b

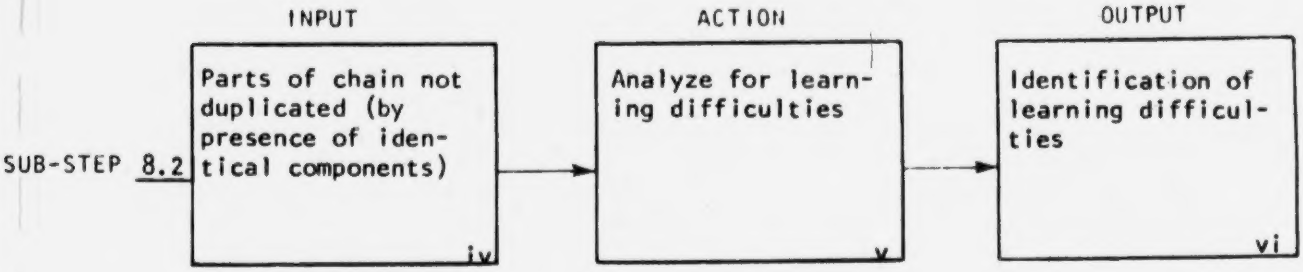
Identify chain as lacking identities ii.b

Identification of uniqueness which will require separate instruction iii.b

from

step	8.2
cell	
page	80

DETAILED ANALYSIS FOR

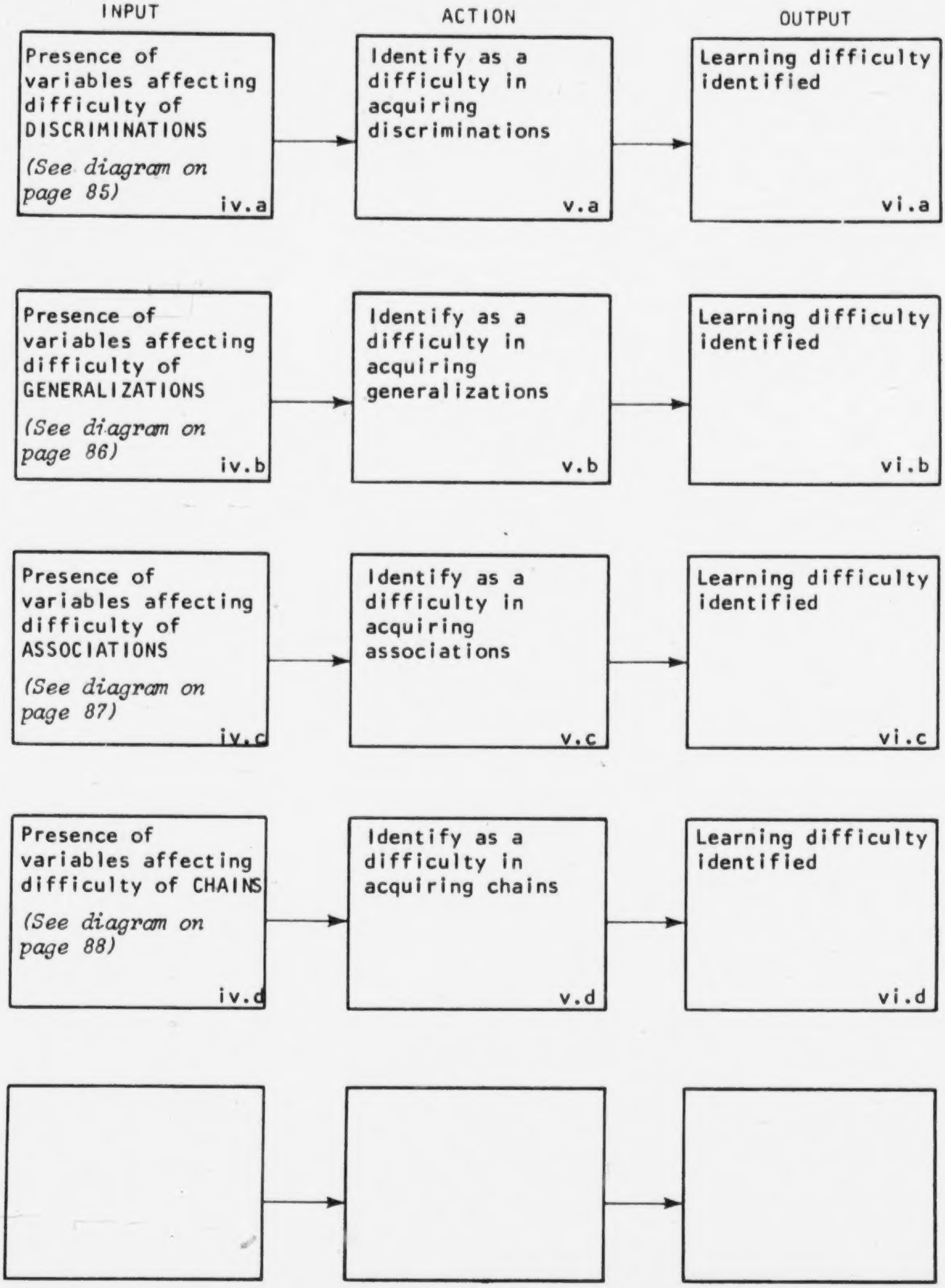

INPUT
ACTION
OUTPUT
SUB-STEP 8.2
Parts of chain not duplicated (by presence of identical components)
iv
Analyze for learning difficulties
v
Identification of learning difficulties
vi

ON NEXT 5 PAGES

from

step	8.2
cell	iv
page	80

MORE DETAILED DIAGRAM FOR DISCRIMINATIONS

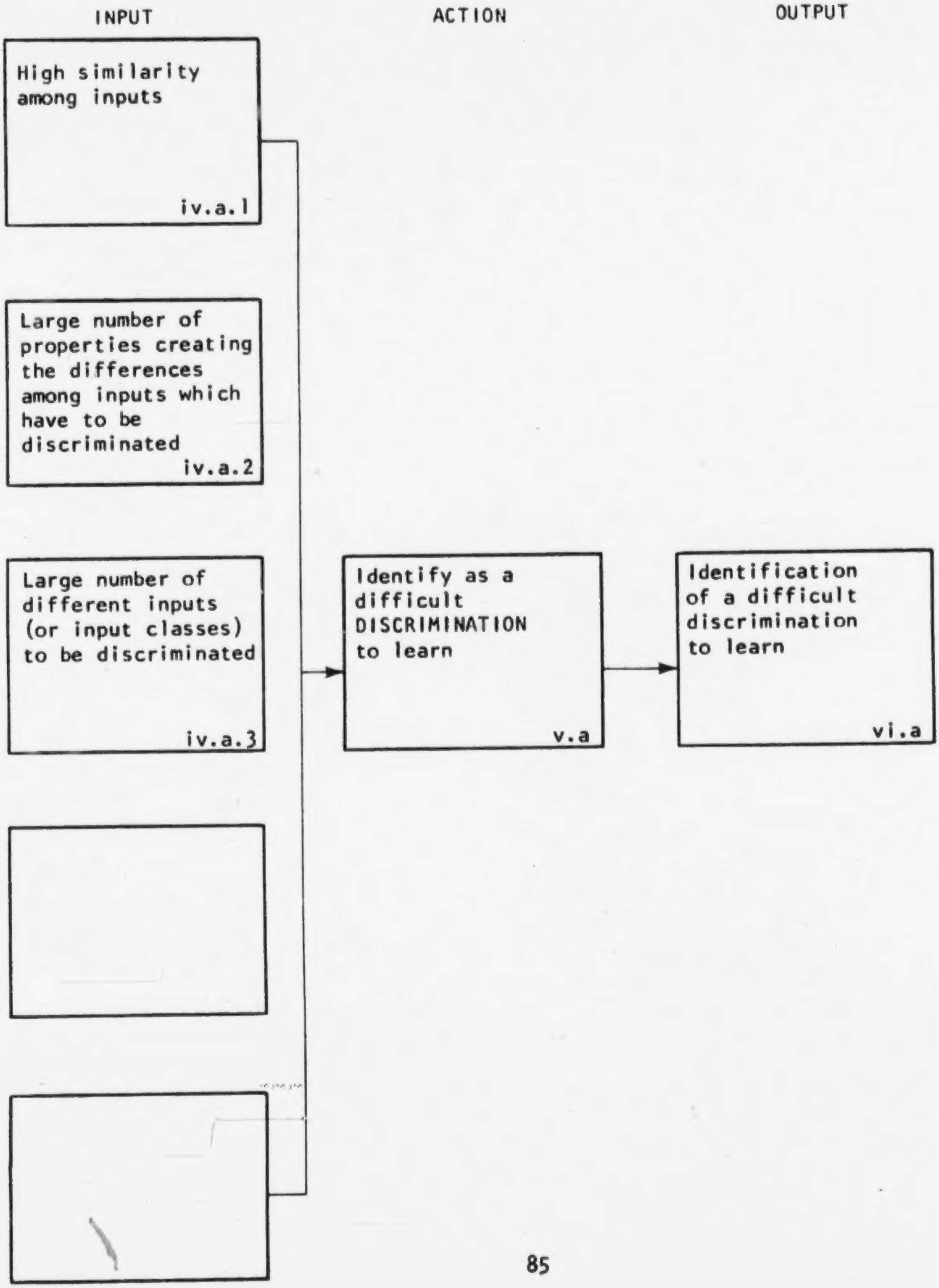


INPUT	ACTION	OUTPUT
Presence of variables affecting difficulty of DISCRIMINATIONS *(See diagram on page 85)* iv.a	Identify as a difficulty in acquiring discriminations v.a	Learning difficulty identified vi.a
Presence of variables affecting difficulty of GENERALIZATIONS *(See diagram on page 86)* iv.b	Identify as a difficulty in acquiring generalizations v.b	Learning difficulty identified vi.b
Presence of variables affecting difficulty of ASSOCIATIONS *(See diagram on page 87)* iv.c	Identify as a difficulty in acquiring associations v.c	Learning difficulty identified vi.c
Presence of variables affecting difficulty of CHAINS *(See diagram on page 88)* iv.d	Identify as a difficulty in acquiring chains v.d	Learning difficulty identified vi.d

from

step	8.2
cell	iv.a
page	84

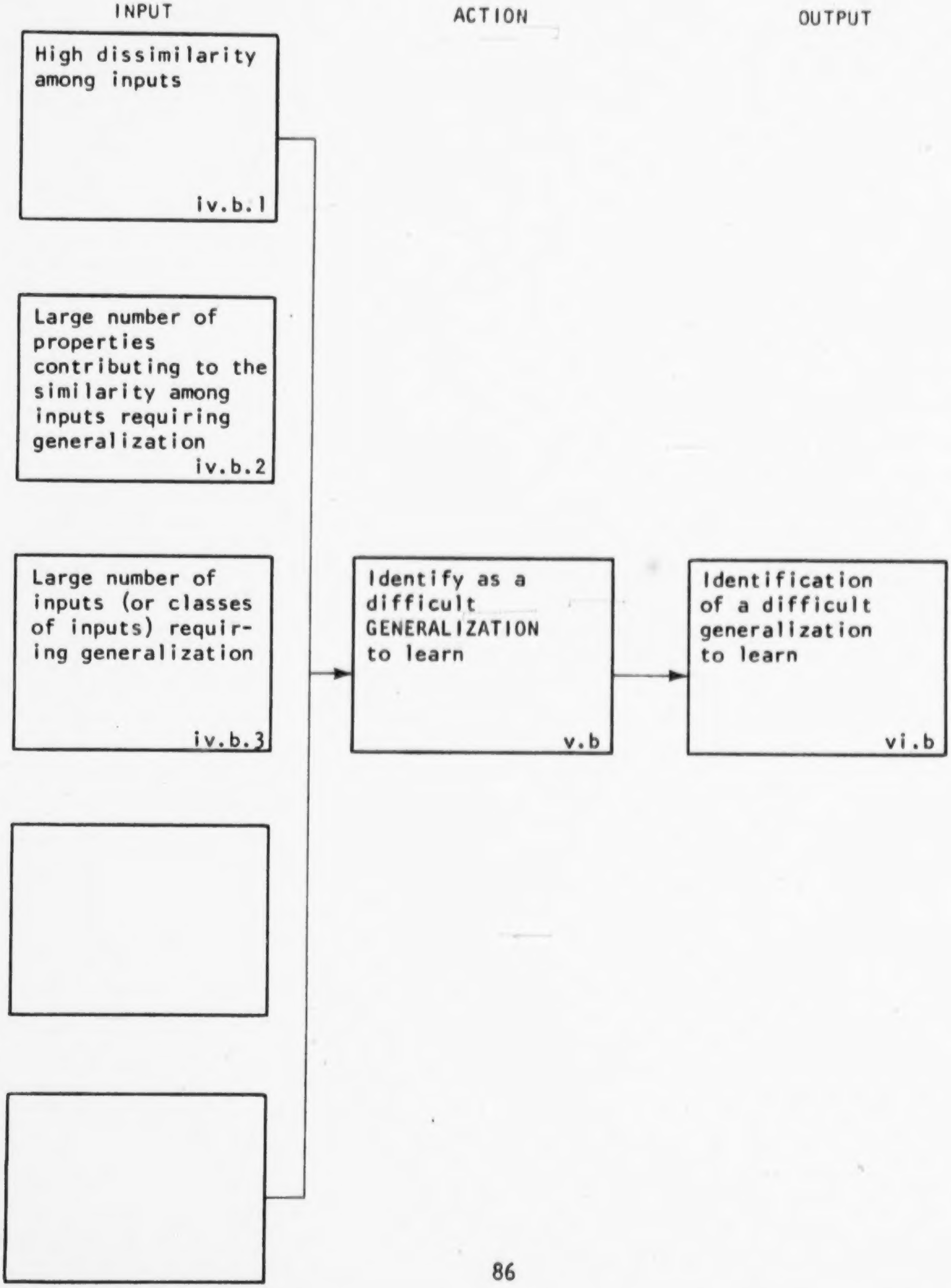
MORE DETAILED DIAGRAM FOR GENERALIZATIONS


INPUT
ACTION
OUTPUT
High similarity among inputs
iv.a.1
Large number of properties creating the differences among inputs which have to be discriminated
iv.a.2
Large number of different inputs (or input classes) to be discriminated
iv.a.3
Identify as a difficult DISCRIMINATION to learn
v.a
Identification of a difficult discrimination to learn
vi.a

from

step	8.2
cell	iv.b
page	84

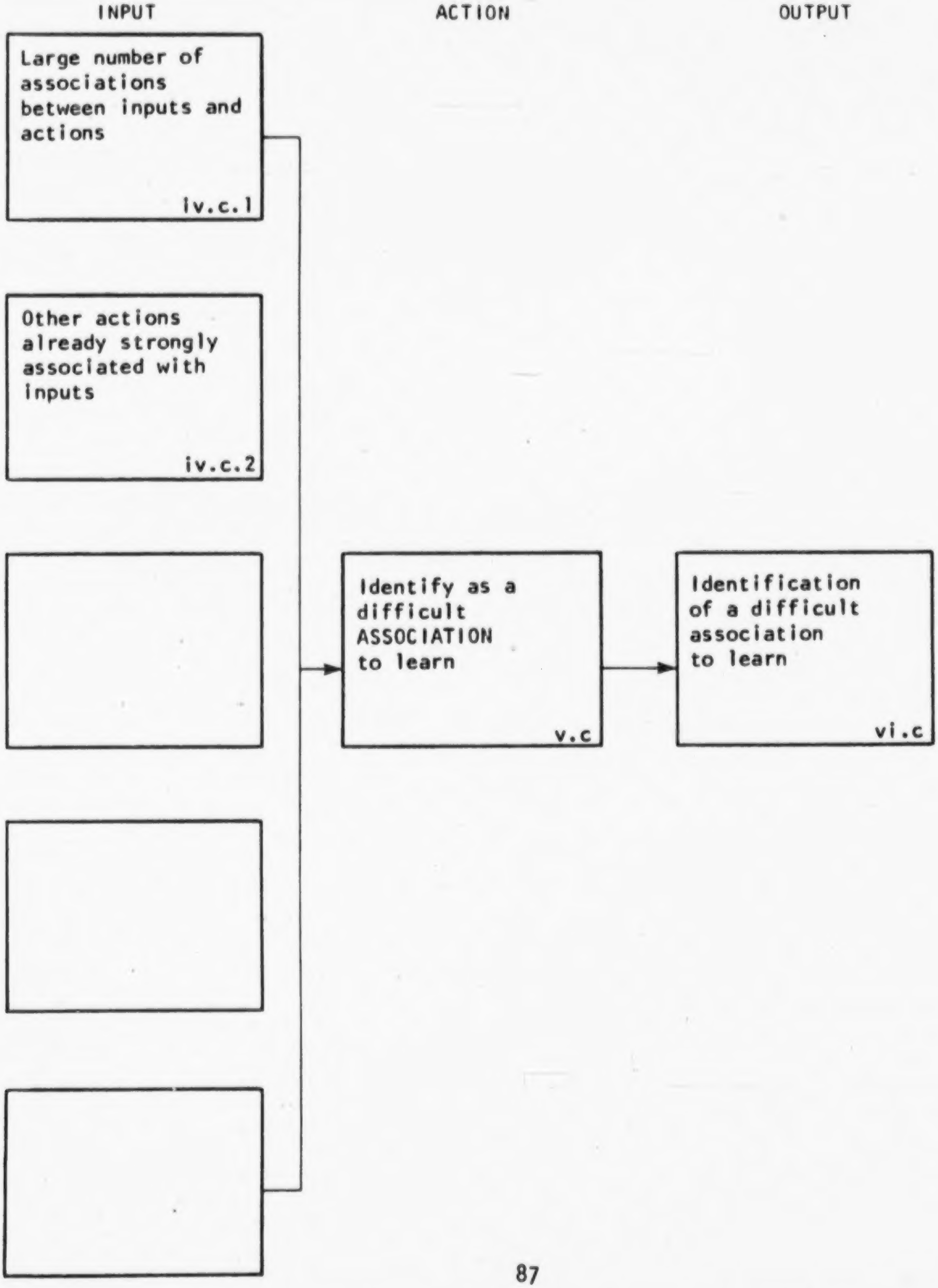
MORE DETAILED DIAGRAM FOR GENERALIZATIONS


INPUT
ACTION
OUTPUT
High dissimilarity among inputs
iv.b.1
Large number of properties contributing to the similarity among inputs requiring generalization
iv.b.2
Large number of inputs (or classes of inputs) requiring generalization
iv.b.3
Identify as a difficult GENERALIZATION to learn
v.b
Identification of a difficult generalization to learn
vi.b

from

step	8.2
cell	iv.c
page	84

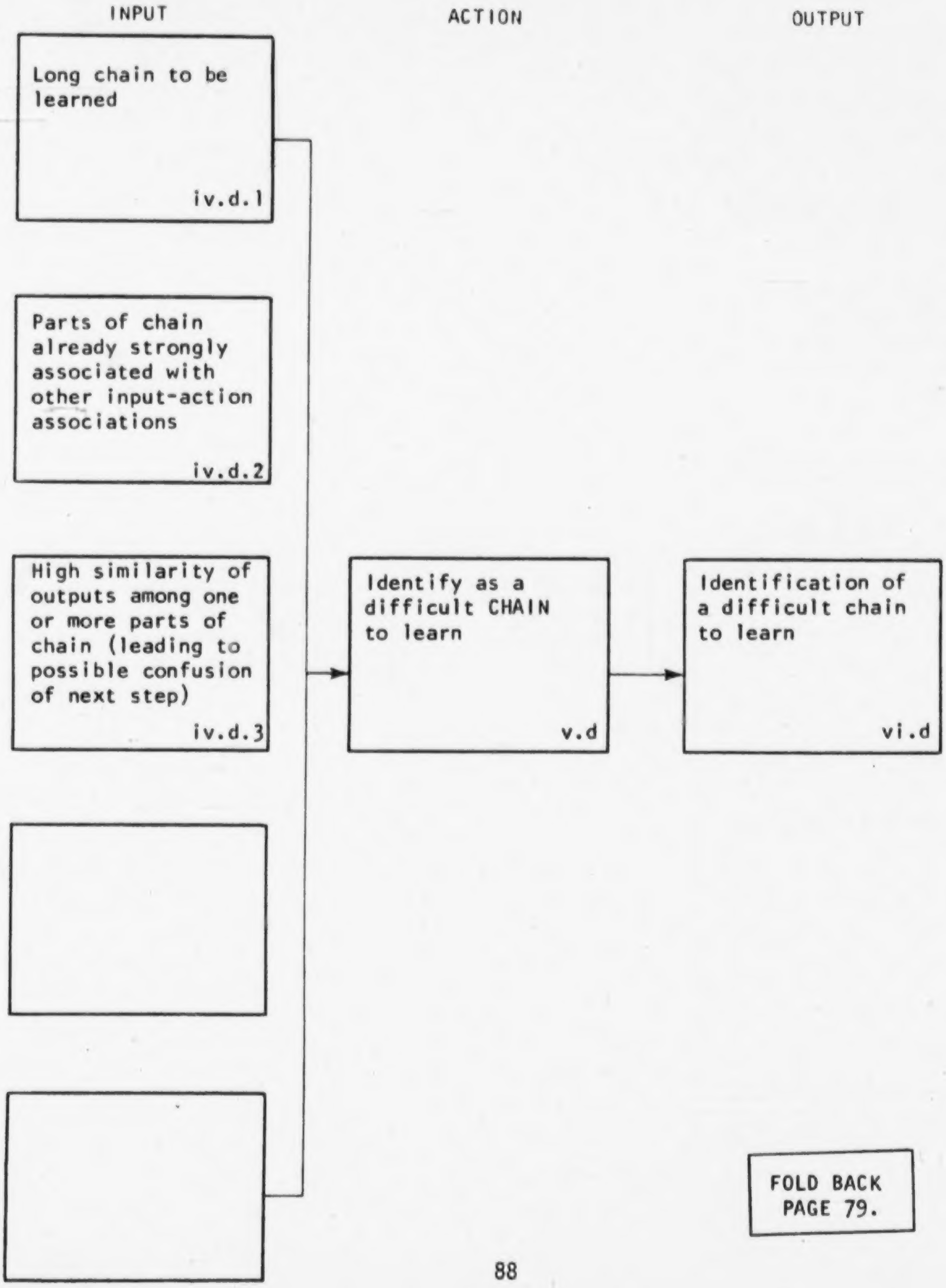
MORE DETAILED
DIAGRAM FOR GENERALIZATIONS


INPUT
ACTION
OUTPUT
Large number of associations between inputs and actions
iv.c.1
Other actions already strongly associated with inputs
iv.c.2
Identify as a difficult ASSOCIATION to learn
v.c
Identification of a difficult association to learn
vi.c

from

step	8.2
cell	iv.d
page	84

MORE DETAILED
DIAGRAM FOR GENERALIZATIONS

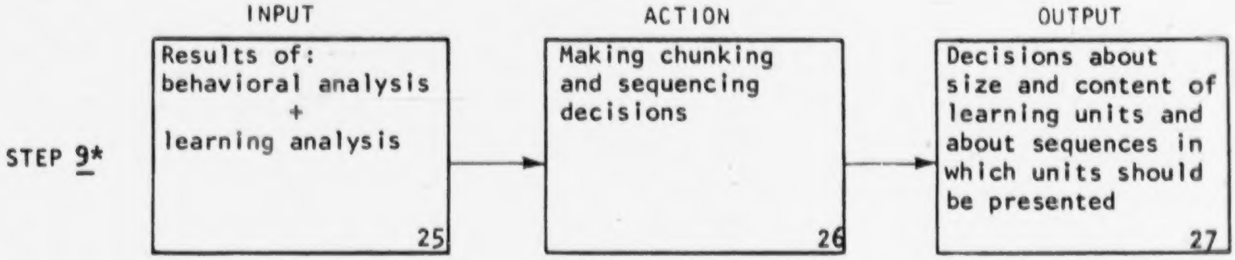

INPUT
ACTION
OUTPUT
Long chain to be learned
iv.d.1
Parts of chain already strongly associated with other input-action associations
iv.d.2
High similarity of outputs among one or more parts of chain (leading to possible confusion of next step)
iv.d.3
Identify as a difficult CHAIN to learn
v.d
Identification of a difficult chain to learn
vi.d

FOLD BACK
PAGE 79.

from

step	9
cell	
page	2

DETAILED ANALYSIS FOR


INPUT
ACTION
OUTPUT
STEP 9*
Results of: behavioral analysis + learning analysis
25
Making chunking and sequencing decisions
26
Decisions about size and content of learning units and about sequences in which units should be presented
27

ON NEXT 12 PAGES

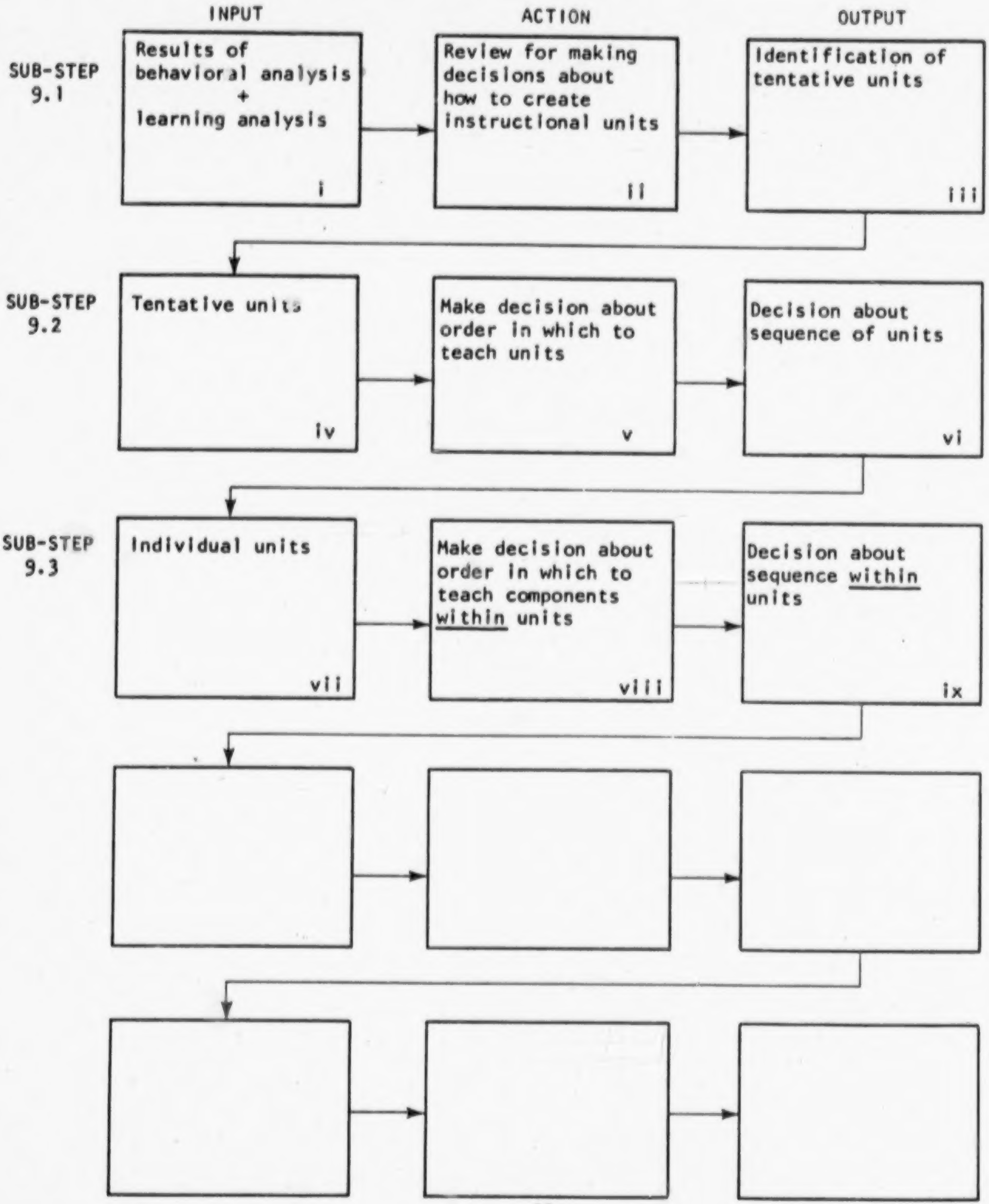
*The performance of Step 9 (identification of learning units and sequencing of units) may appropriately be considered to involve "strategy" considerations and, therefore, should be performed in Step 11. Since, in any case, the task precedes the tasks in Step 11, it remains convenient to perform this task as Step 9. Moreover, it is useful for the step to precede Step 10 (preparation of tests) which, in order to be performed with some degree of organization, requires some degree of organization of the material (i.e., the identification of units) about which the tests will test.

FOLD OUT THIS PAGE.

from

step	9
cell	
page	2

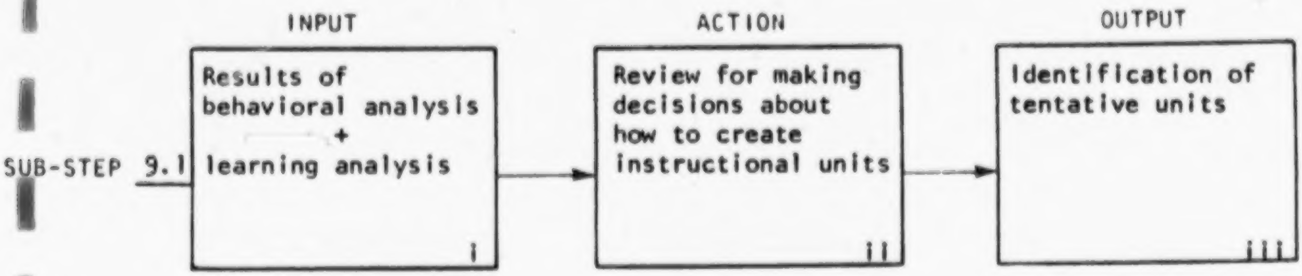
MORE DETAILED DIAGRAM FOR CHAINS


INPUT
ACTION
OUTPUT
SUB-STEP 9.1
Results of behavioral analysis + learning analysis
i
Review for making decisions about how to create instructional units
ii
Identification of tentative units
iii
SUB-STEP 9.2
Tentative units
iv
Make decision about order in which to teach units
v
Decision about sequence of units
vi
SUB-STEP 9.3
Individual units
vii
Make decision about order in which to teach components within units
viii
Decision about sequence within units
ix

from

step	9.1
cell	
page	90

DETAILED ANALYSIS FOR

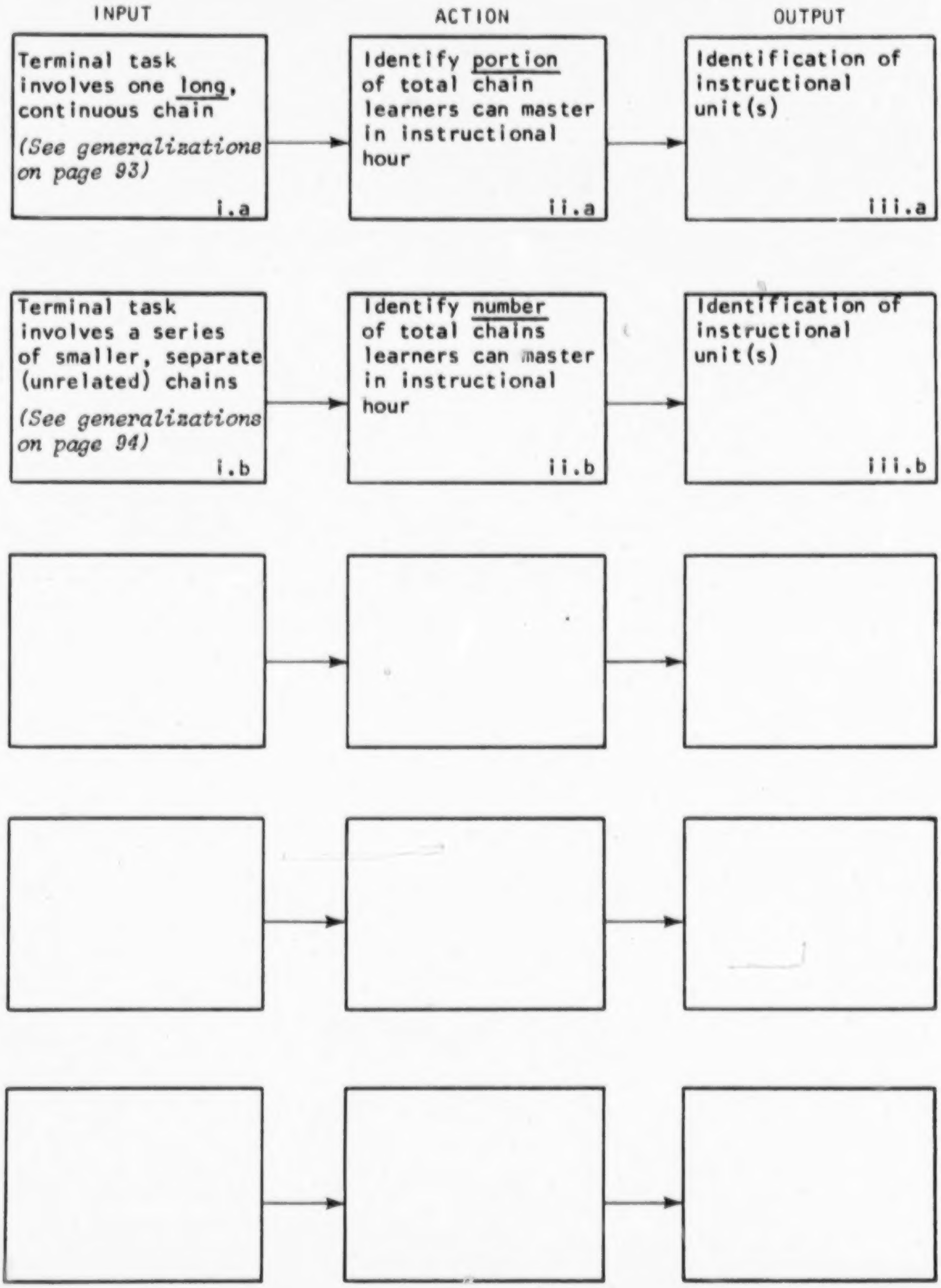

INPUT
ACTION
OUTPUT
SUB-STEP 9.1
Results of behavioral analysis + learning analysis
i
Review for making decisions about how to create instructional units
ii
Identification of tentative units
iii

ON NEXT 3 PAGES

from

step	9.1
cell	i
page	90

MORE DETAILED DIAGRAM FOR DISCRIMINATIONS (1)



Terminal task involves one long, continuous chain

(See generalizations on page 93)

i.a

Identify portion of total chain learners can master in instructional hour

ii.a

Identification of instructional unit(s)

iii.a

Terminal task involves a series of smaller, separate (unrelated) chains

(See generalizations on page 94)

i.b

Identify number of total chains learners can master in instructional hour

ii.b

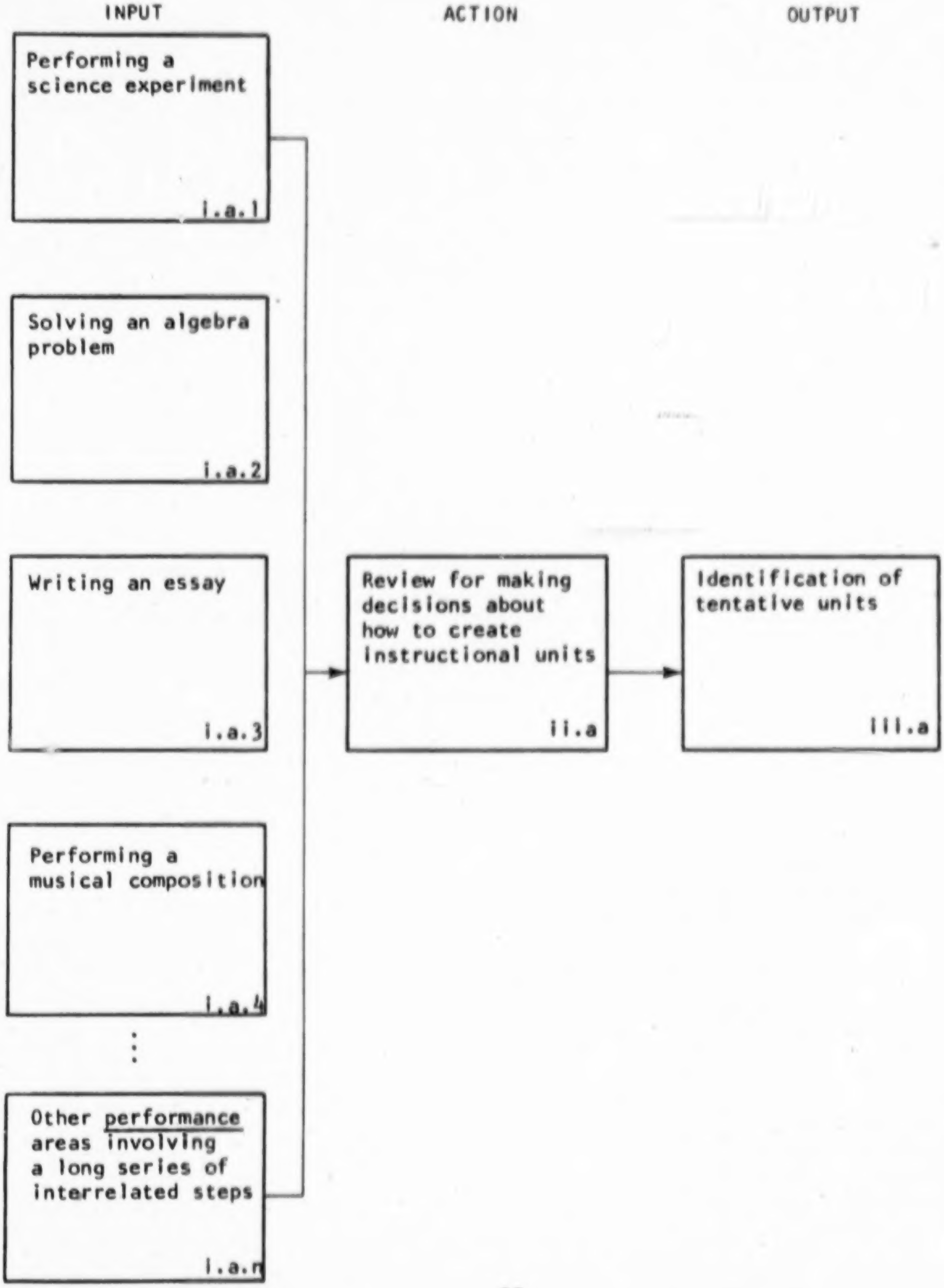
Identification of instructional unit(s)

iii.b

from

step	9.1
cell	i.a
page	92

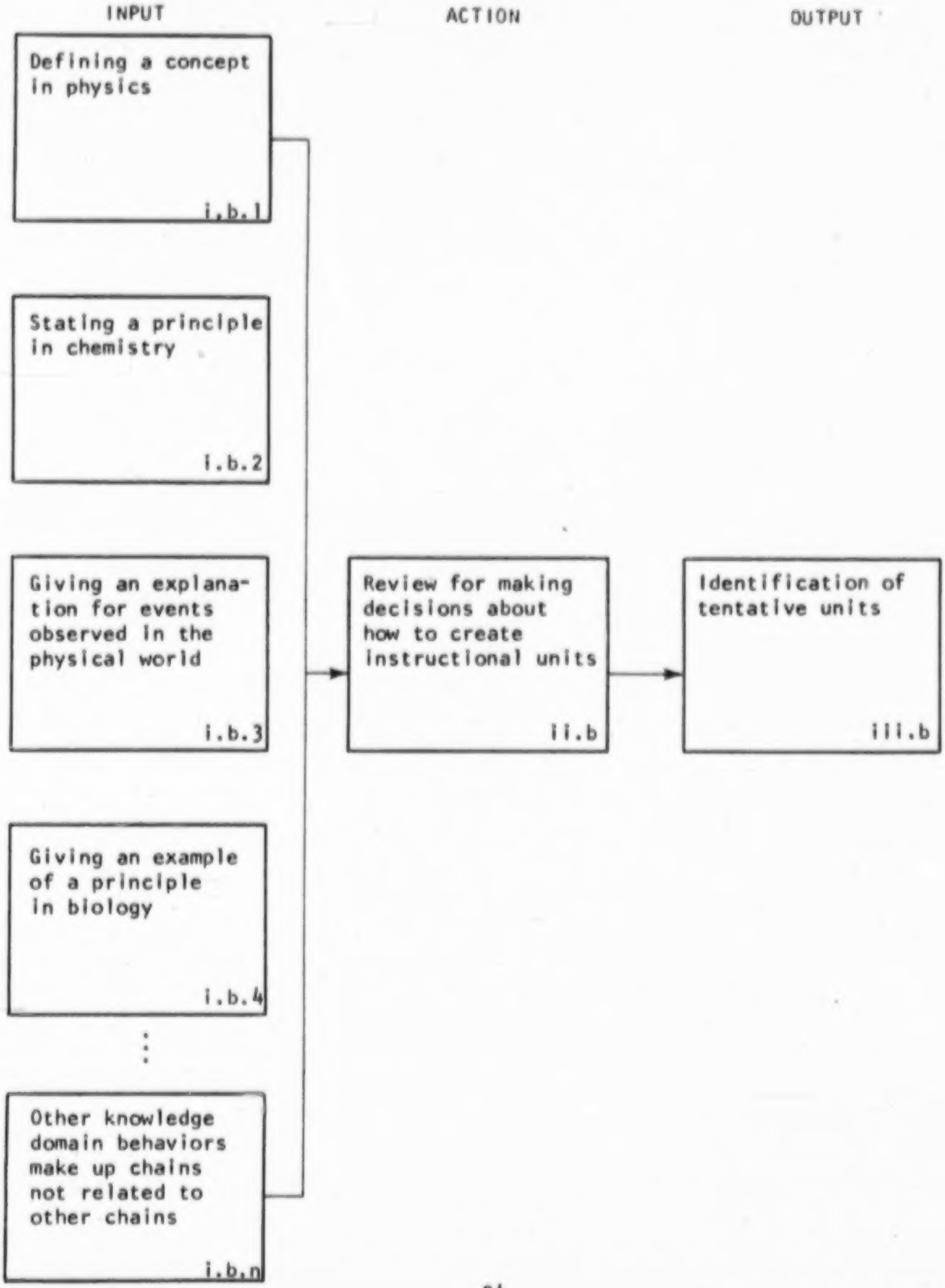
MORE DETAILED DIAGRAM FOR GENERALIZATIONS


INPUT
ACTION
OUTPUT
Performing a science experiment
i.a.1
Solving an algebra problem
i.a.2
Writing an essay
i.a.3
Performing a musical composition
i.a.4
Other performance areas involving a long series of interrelated steps
i.a.n
Review for making decisions about how to create instructional units
ii.a
Identification of tentative units
iii.a

from

step	9.1
cell	i.b
page	92

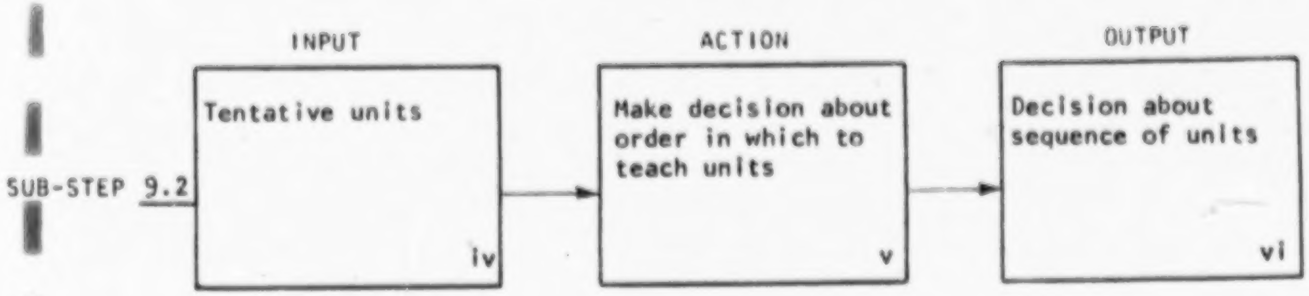
MORE DETAILED DIAGRAM FOR GENERALIZATIONS


INPUT
ACTION
OUTPUT
Defining a concept in physics
i.b.1
Stating a principle in chemistry
i.b.2
Giving an explanation for events observed in the physical world
i.b.3
Giving an example of a principle in biology
i.b.4
Other knowledge domain behaviors make up chains not related to other chains
i.b.n
Review for making decisions about how to create instructional units
ii.b
Identification of tentative units
iii.b

from

step	9.2
cell	
page	90

DETAILED ANALYSIS FOR

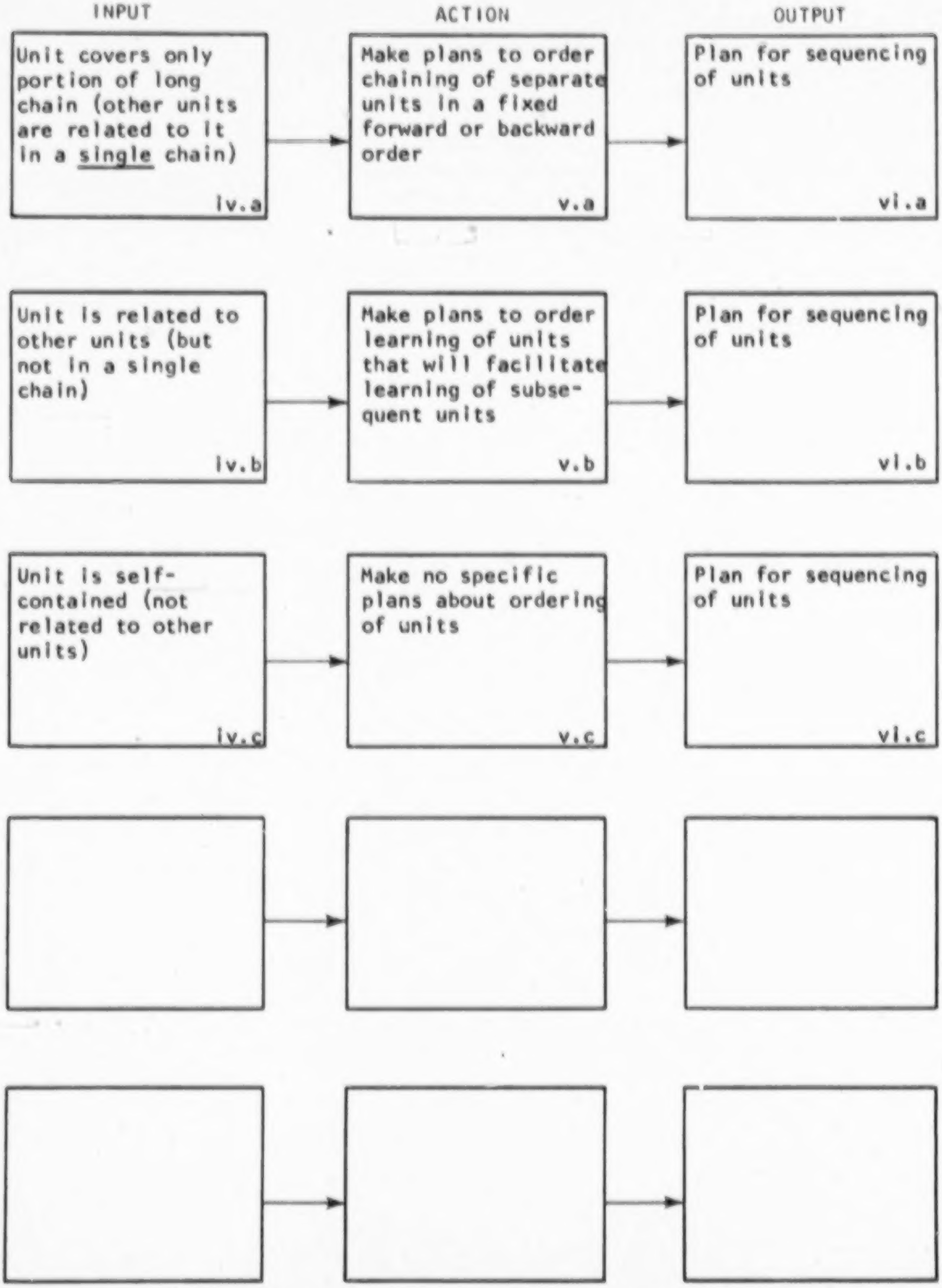

INPUT
ACTION
OUTPUT
SUB-STEP 9.2
Tentative units
iv
Make decision about order in which to teach units
v
Decision about sequence of units
vi

ON NEXT 1 PAGE

from

step	9.2
cell	iv
page	90

MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS

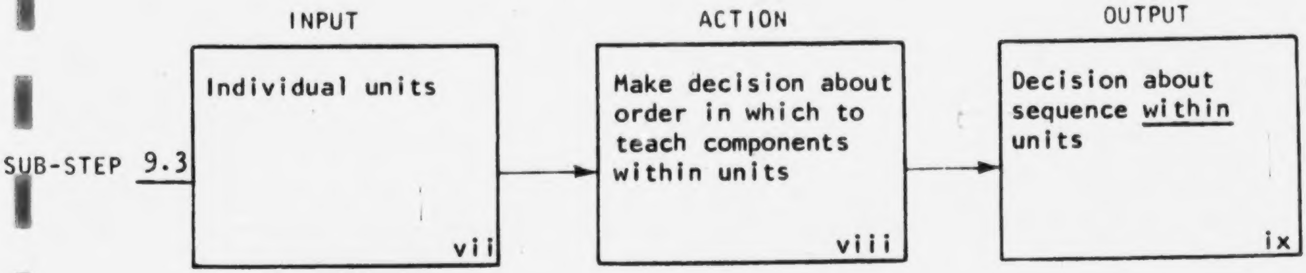


INPUT	ACTION	OUTPUT
Unit covers only portion of long chain (other units are related to it in a single chain) iv.a	Make plans to order chaining of separate units in a fixed forward or backward order v.a	Plan for sequencing of units vi.a
Unit is related to other units (but not in a single chain) iv.b	Make plans to order learning of units that will facilitate learning of subsequent units v.b	Plan for sequencing of units vi.b
Unit is self-contained (not related to other units) iv.c	Make no specific plans about ordering of units v.c	Plan for sequencing of units vi.c

from

step	9.3
cell	
page	90

DETAILED ANALYSIS FOR

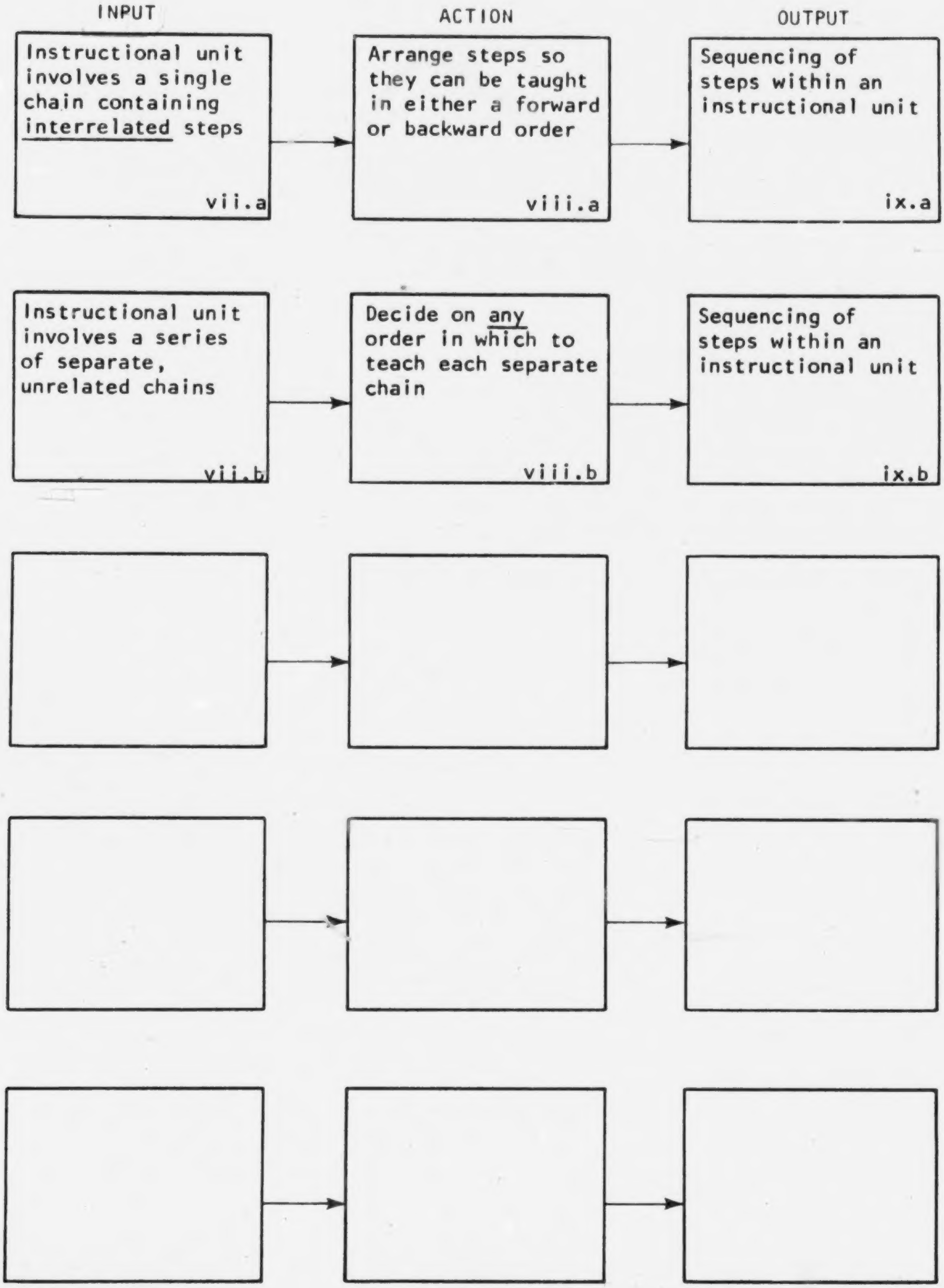

INPUT
ACTION
OUTPUT
SUB-STEP 9.3
Individual units
vii
Make decision about order in which to teach components within units
viii
Decision about sequence within units
ix

ON NEXT 3 PAGES

from

step	9.3
cell	vii
page	90

MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS (1)



Instructional unit involves a single chain containing interrelated steps vii.a

Arrange steps so they can be taught in either a forward or backward order viii.a

Sequencing of steps within an instructional unit ix.a

Instructional unit involves a series of separate, unrelated chains vii.b

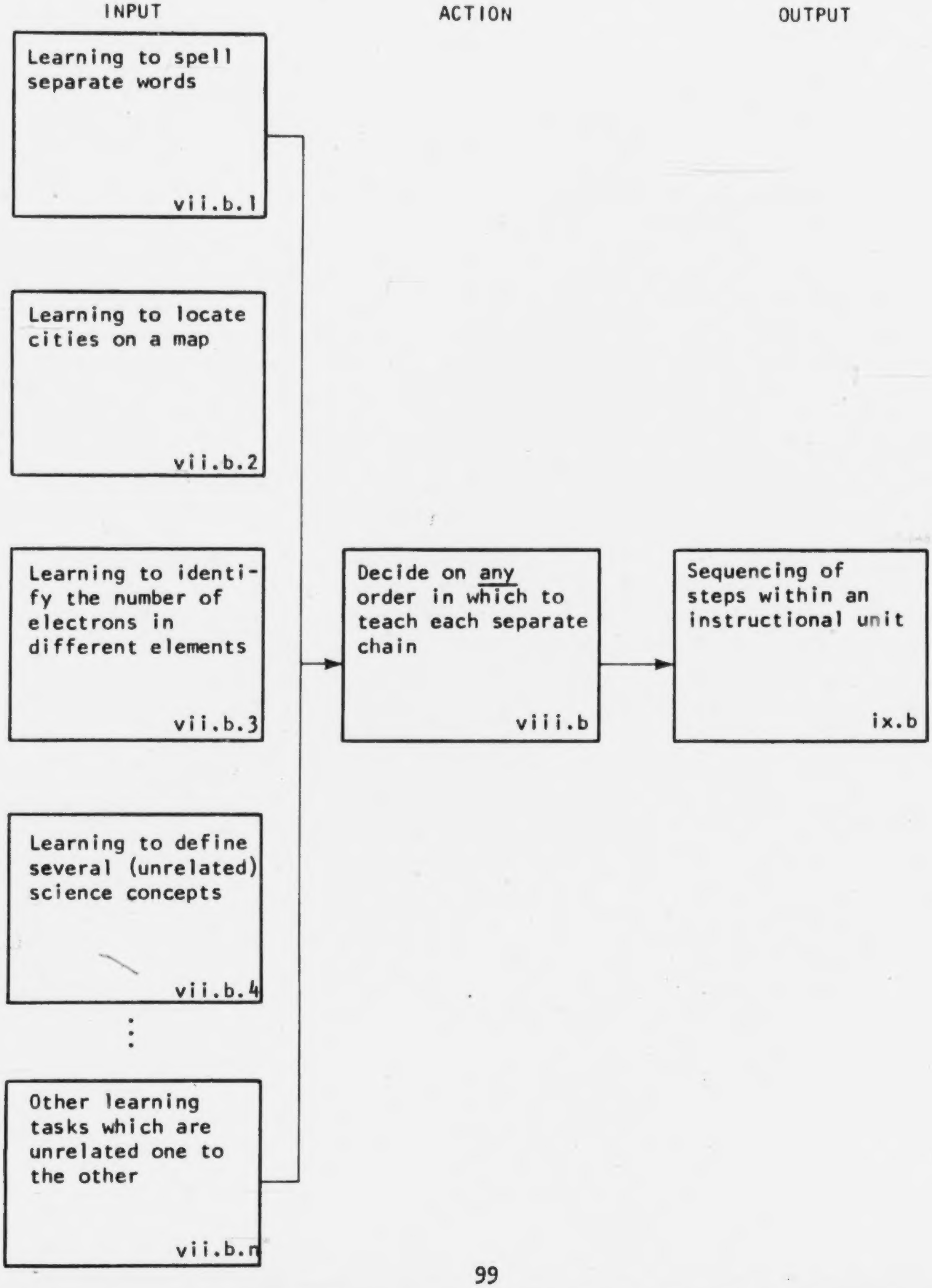
Decide on any order in which to teach each separate chain viii.b

Sequencing of steps within an instructional unit ix.b

from

step	9.3
cell	vii.b
page	90

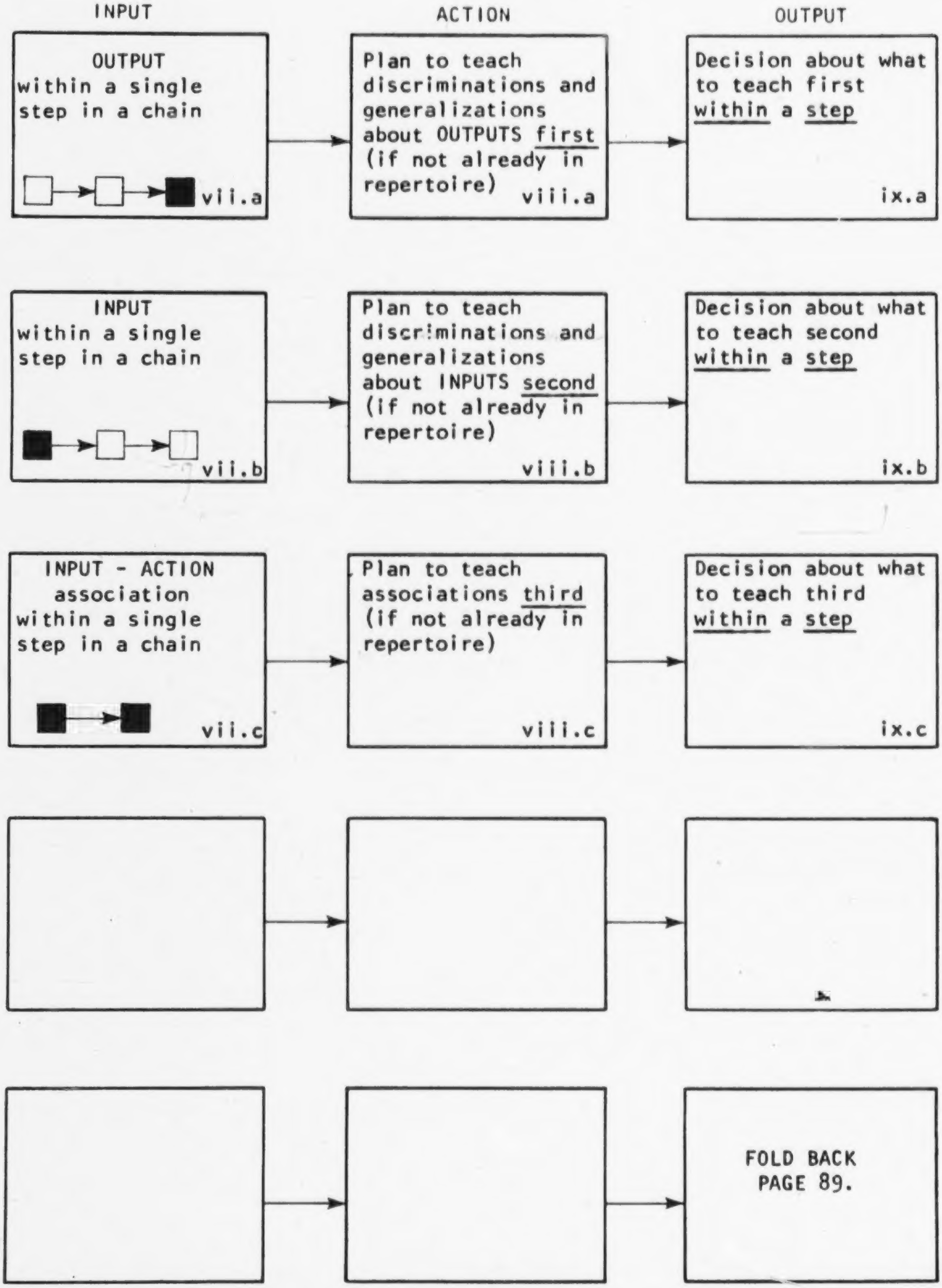
MORE DETAILED DIAGRAM FOR GENERALIZATIONS


INPUT
ACTION
OUTPUT
Learning to spell separate words
vii.b.1
Learning to locate cities on a map
vii.b.2
Learning to identify the number of electrons in different elements
vii.b.3
Learning to define several (unrelated) science concepts
vii.b.4
Other learning tasks which are unrelated one to the other
vii.b.n
Decide on any order in which to teach each separate chain
viii.b
Sequencing of steps within an instructional unit
ix.b

from

step	9.3
cell	vii
page	90

MORE DETAILED DIAGRAM FOR DISCRIMINATIONS (2)



OUTPUT within a single step in a chain

Plan to teach discriminations and generalizations about OUTPUTS first (if not already in repertoire)

Decision about what to teach first within a step

INPUT within a single step in a chain

Plan to teach discriminations and generalizations about INPUTS second (if not already in repertoire)

Decision about what to teach second within a step

INPUT - ACTION association within a single step in a chain

Plan to teach associations third (if not already in repertoire)

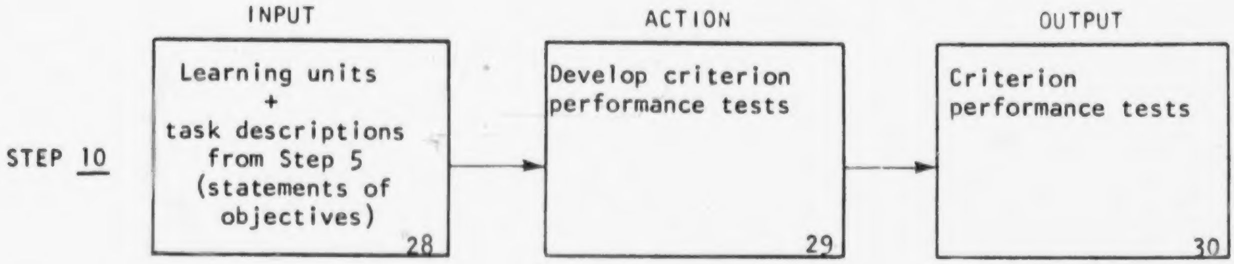
Decision about what to teach third within a step

FOLD BACK PAGE 89.

from

step	10
cell	
page	2

DETAILED ANALYSIS FOR


INPUT
ACTION
OUTPUT
STEP 10
Learning units + task descriptions from Step 5 (statements of objectives)
28
Develop criterion performance tests
29
Criterion performance tests
30

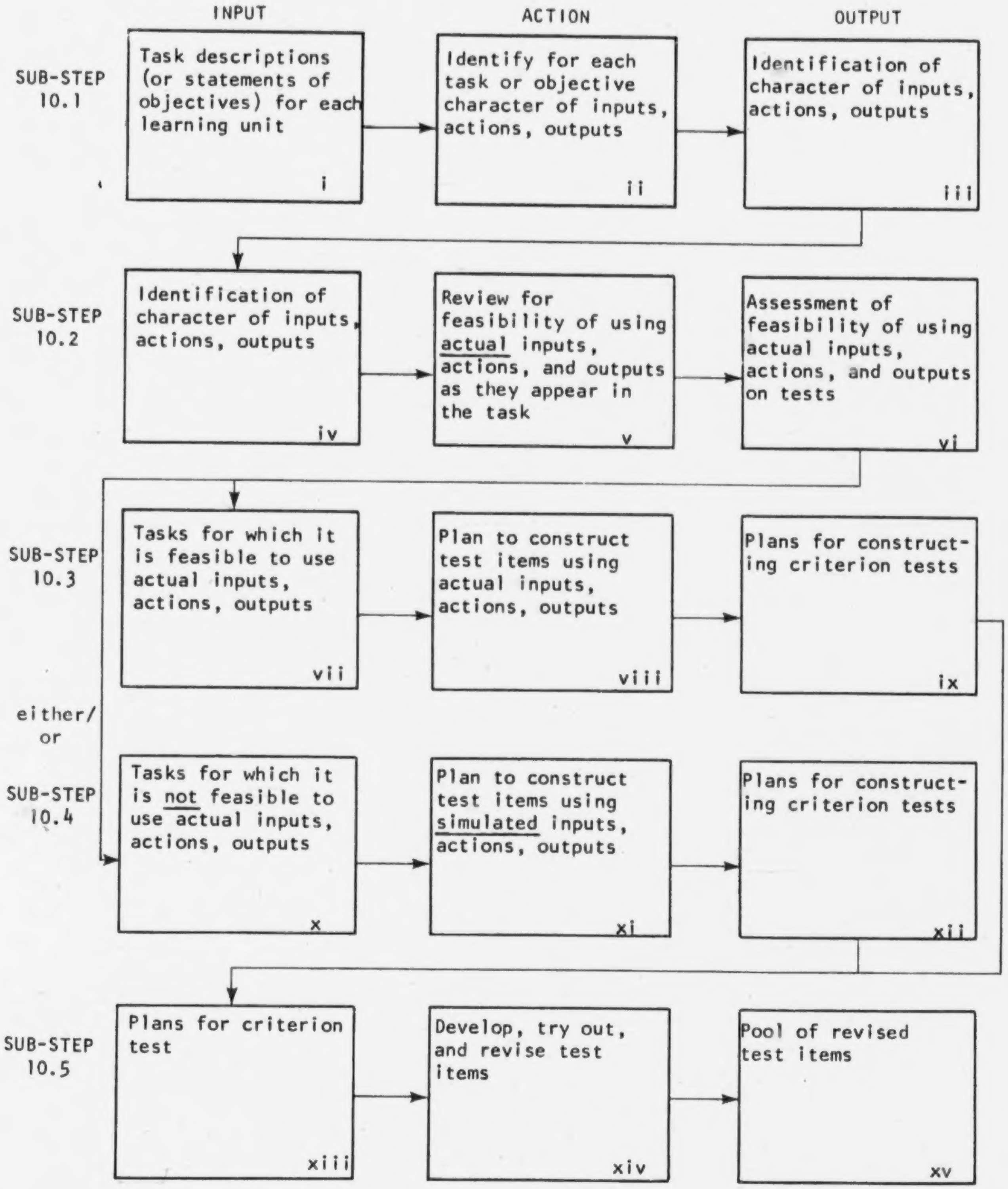
ON NEXT 16 PAGES

FOLD OUT THIS PAGE.

from

step	10
cell	
page	2

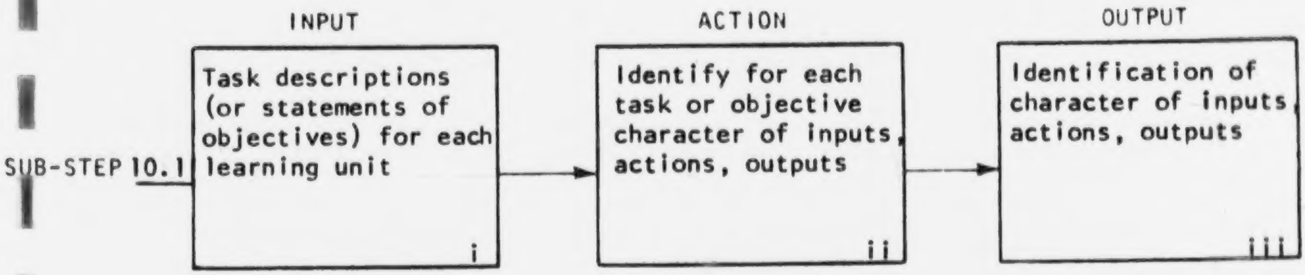
MORE DETAILED DIAGRAM FOR CHAINS


INPUT
ACTION
OUTPUT
SUB-STEP 10.1
Task descriptions (or statements of objectives) for each learning unit
i
Identify for each task or objective character of inputs, actions, outputs
ii
Identification of character of inputs, actions, outputs
iii
SUB-STEP 10.2
Identification of character of inputs, actions, outputs
iv
Review for feasibility of using actual inputs, actions, and outputs as they appear in the task
v
Assessment of feasibility of using actual inputs, actions, and outputs on tests
vi
SUB-STEP 10.3
Tasks for which it is feasible to use actual inputs, actions, outputs
vii
Plan to construct test items using actual inputs, actions, outputs
viii
Plans for constructing criterion tests
ix
either/or
SUB-STEP 10.4
Tasks for which it is not feasible to use actual inputs, actions, outputs
x
Plan to construct test items using simulated inputs, actions, outputs
xi
Plans for constructing criterion tests
xii
SUB-STEP 10.5
Plans for criterion test
xiii
Develop, try out, and revise test items
xiv
Pool of revised test items
xv

from

step	10.1
cell	
page	102

DETAILED ANALYSIS FOR

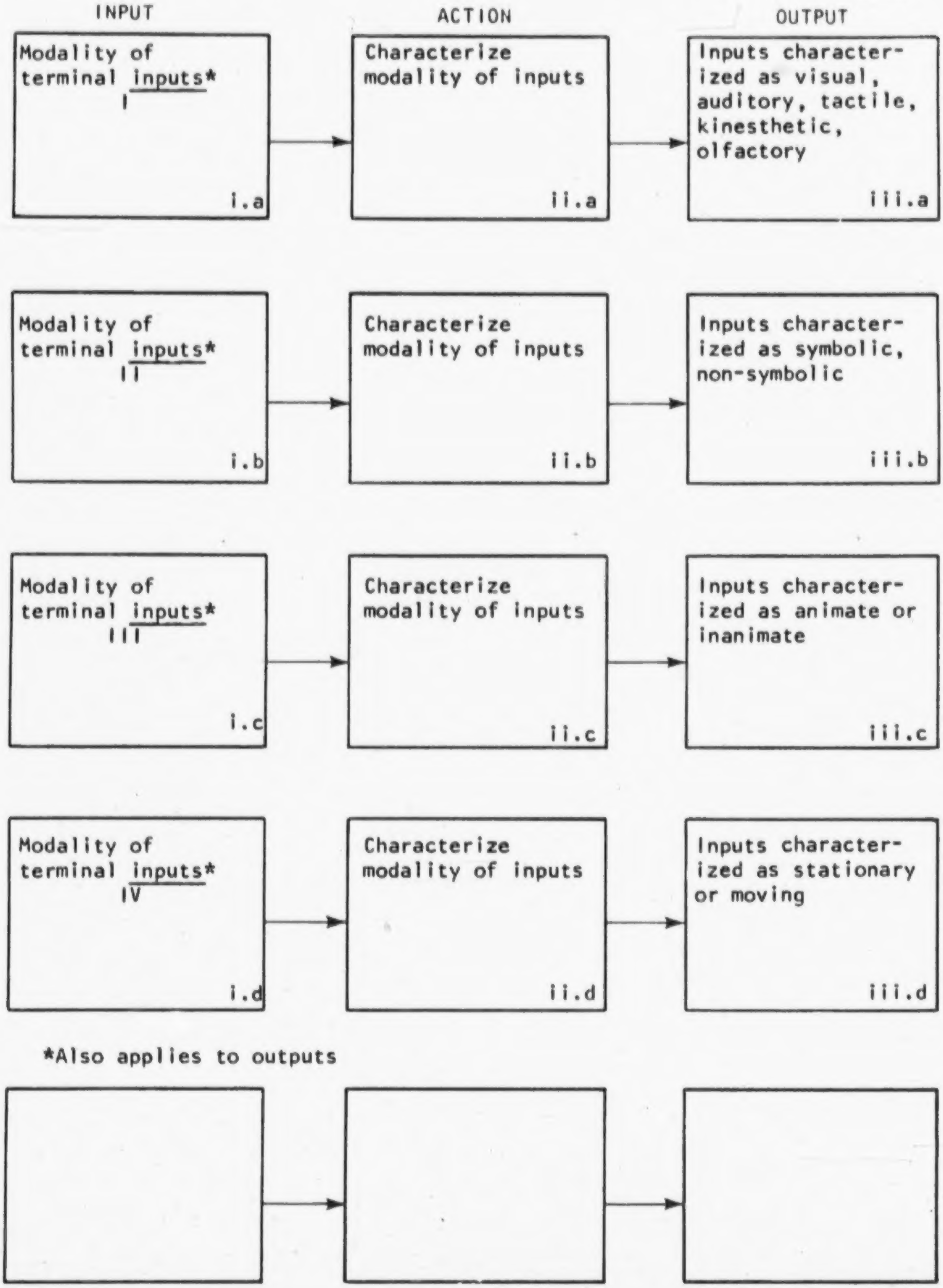

INPUT
ACTION
OUTPUT
SUB-STEP 10.1
Task descriptions (or statements of objectives) for each learning unit
i
Identify for each task or objective character of inputs, actions, outputs
ii
Identification of character of inputs, actions, outputs
iii

ON NEXT 2 PAGES

from

step	10.1
cell	i
page	102

MORE DETAILED DIAGRAM FOR DISCRIMINATIONS (1)



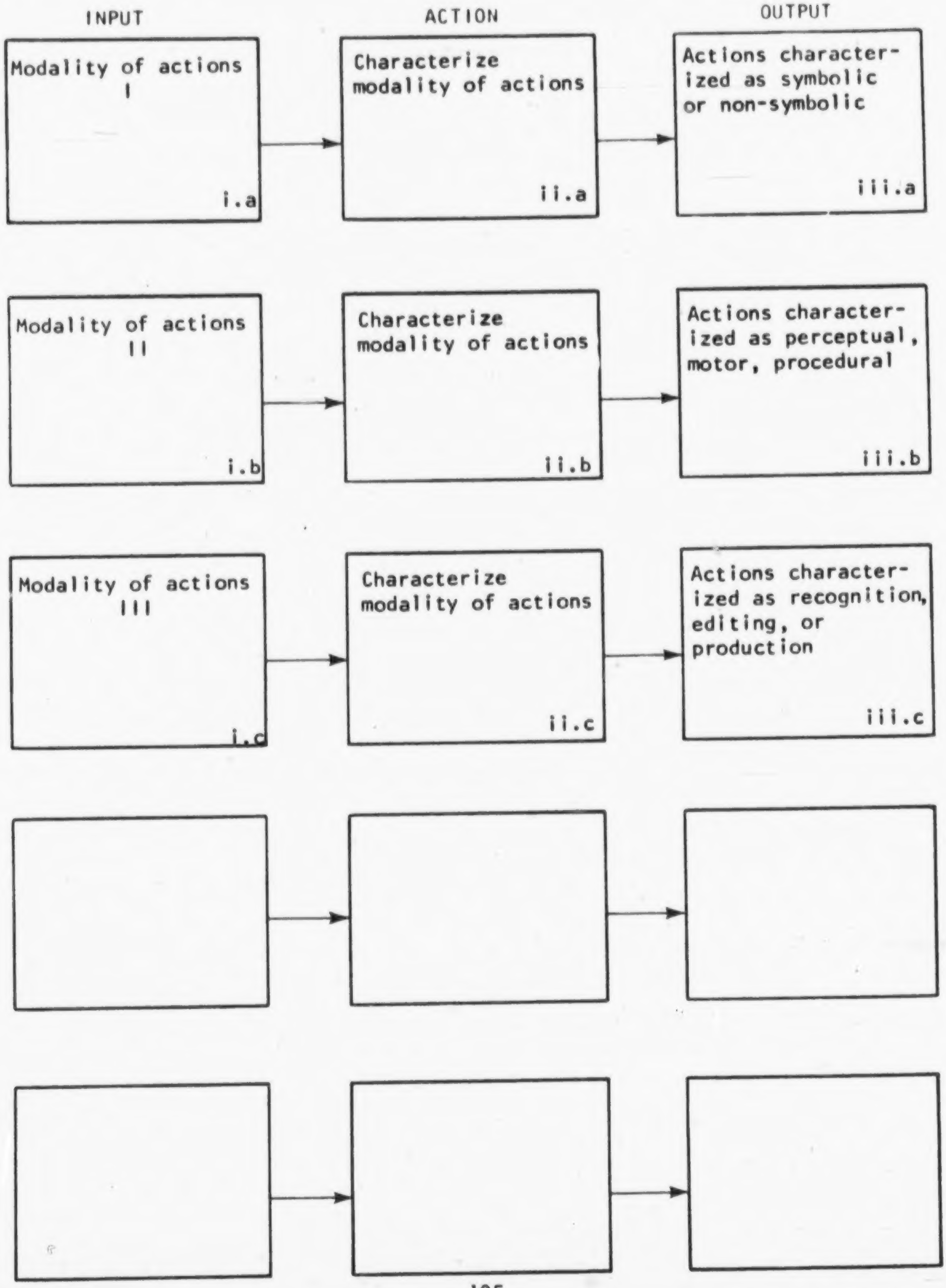
INPUT	ACTION	OUTPUT
Modality of terminal inputs* I — i.a	Characterize modality of inputs — ii.a	Inputs characterized as visual, auditory, tactile, kinesthetic, olfactory — iii.a
Modality of terminal inputs* II — i.b	Characterize modality of inputs — ii.b	Inputs characterized as symbolic, non-symbolic — iii.b
Modality of terminal inputs* III — i.c	Characterize modality of inputs — ii.c	Inputs characterized as animate or inanimate — iii.c
Modality of terminal inputs* IV — i.d	Characterize modality of inputs — ii.d	Inputs characterized as stationary or moving — iii.d

*Also applies to outputs

from

step	10.1
cell	i
page	102

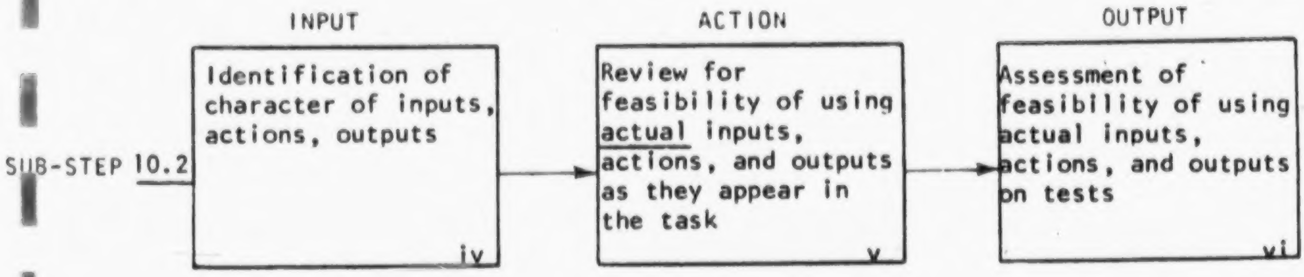
MORE DETAILED DIAGRAM FOR DISCRIMINATIONS (2)


INPUT
ACTION
OUTPUT
Modality of actions I
i.a
Characterize modality of actions
ii.a
Actions characterized as symbolic or non-symbolic
iii.a
Modality of actions II
i.b
Characterize modality of actions
ii.b
Actions characterized as perceptual, motor, procedural
iii.b
Modality of actions III
i.c
Characterize modality of actions
ii.c
Actions characterized as recognition, editing, or production
iii.c

from

step	10.2
cell	
page	102

DETAILED ANALYSIS FOR

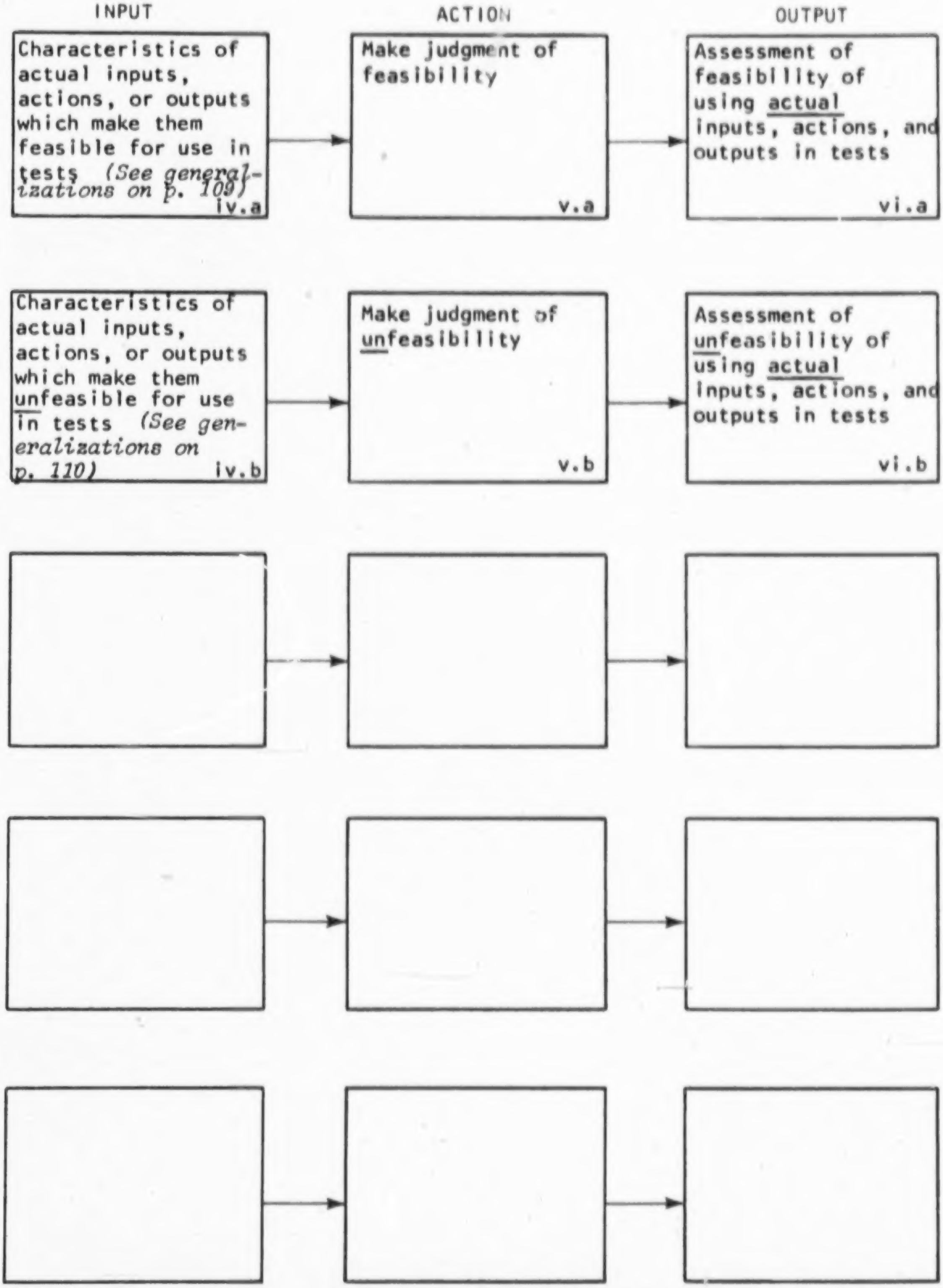

INPUT
ACTION
OUTPUT
SUB-STEP 10.2
Identification of character of inputs, actions, outputs
iv
Review for feasibility of using actual inputs, actions, and outputs as they appear in the task
v
Assessment of feasibility of using actual inputs, actions, and outputs on tests
vi

ON NEXT 3 PAGES

from

step	10.2
cell	iv
page	102

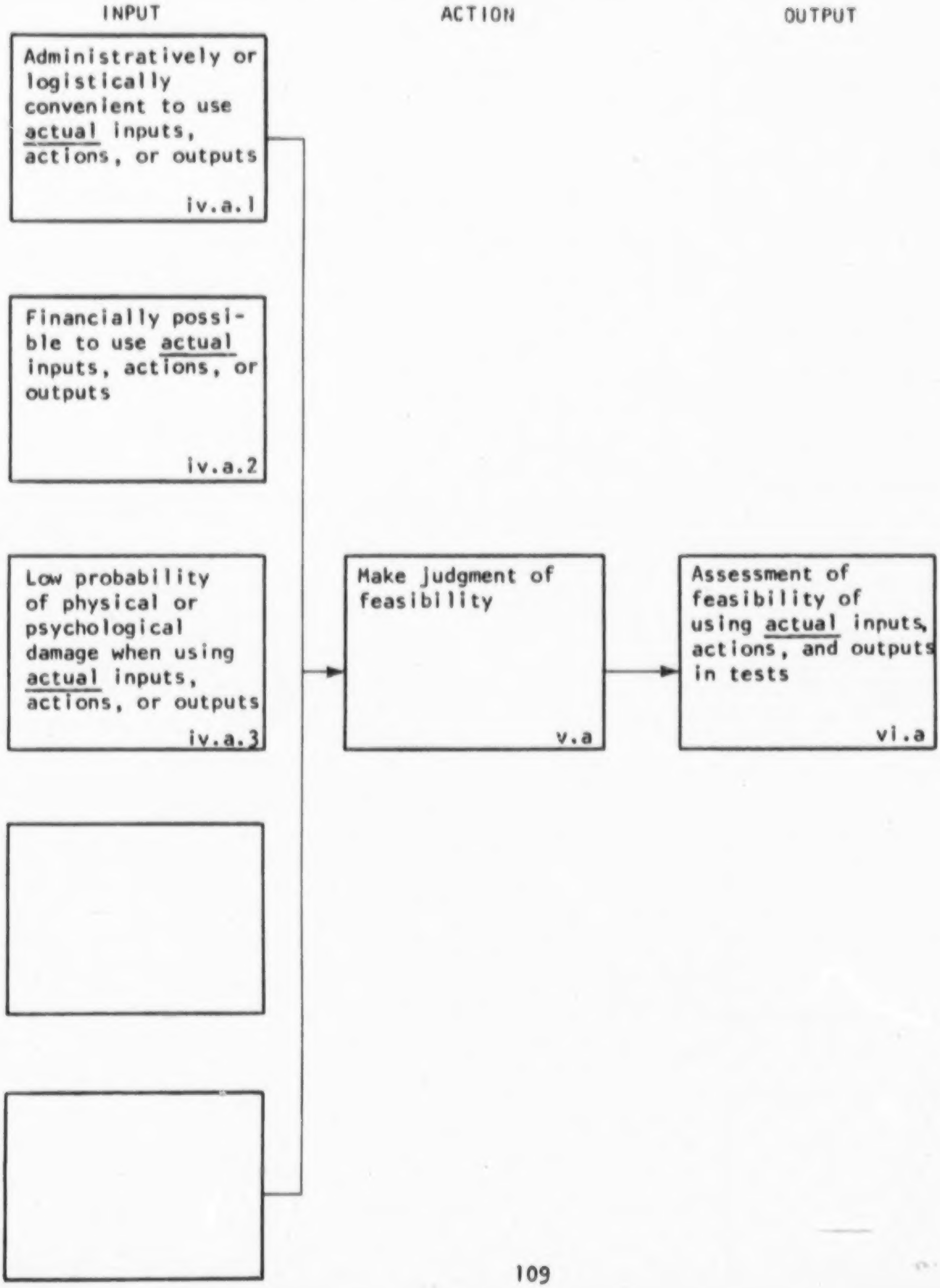
MORE DETAILED DIAGRAM FOR DISCRIMINATIONS



INPUT	ACTION	OUTPUT
Characteristics of actual inputs, actions, or outputs which make them feasible for use in tests *(See generalizations on p. 109)* iv.a	Make judgment of feasibility v.a	Assessment of feasibility of using actual inputs, actions, and outputs in tests vi.a
Characteristics of actual inputs, actions, or outputs which make them unfeasible for use in tests *(See generalizations on p. 110)* iv.b	Make judgment of unfeasibility v.b	Assessment of unfeasibility of using actual inputs, actions, and outputs in tests vi.b

from	
step	10.2
cell	iv.a
page	108

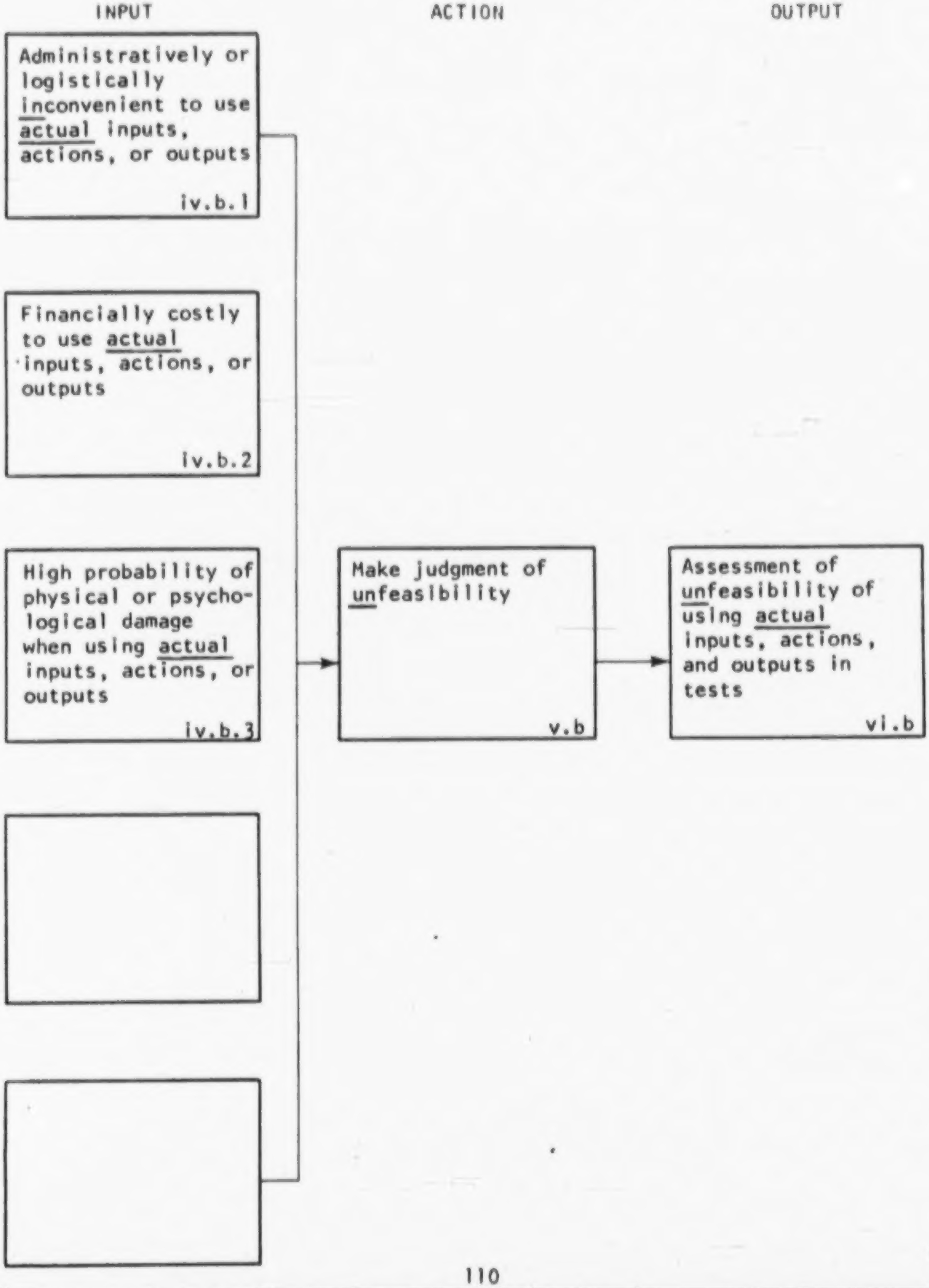
MORE DETAILED DIAGRAM FOR GENERALIZATIONS


INPUT
ACTION
OUTPUT
Administratively or logistically convenient to use actual inputs, actions, or outputs
iv.a.1
Financially possible to use actual inputs, actions, or outputs
iv.a.2
Low probability of physical or psychological damage when using actual inputs, actions, or outputs
iv.a.3
Make judgment of feasibility
v.a
Assessment of feasibility of using actual inputs, actions, and outputs in tests
vi.a

from

step	10.2
cell	iv.b
page	108

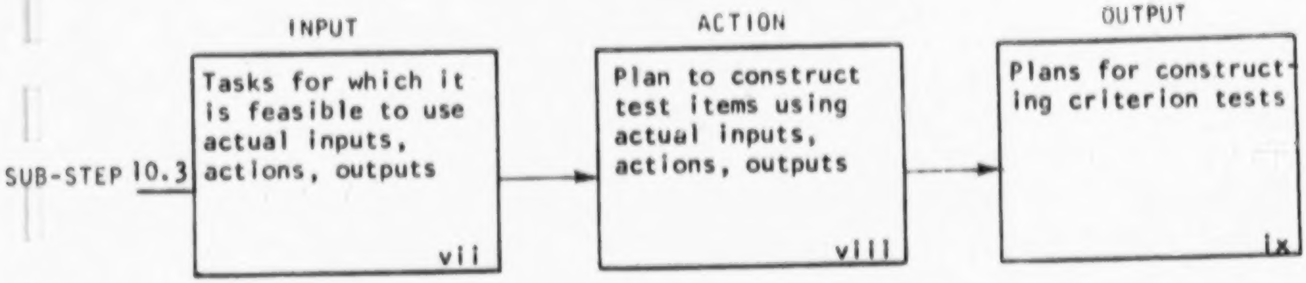
MORE DETAILED DIAGRAM FOR GENERALIZATIONS


INPUT
ACTION
OUTPUT
Administratively or logistically inconvenient to use actual inputs, actions, or outputs
iv.b.1
Financially costly to use actual inputs, actions, or outputs
iv.b.2
High probability of physical or psychological damage when using actual inputs, actions, or outputs
iv.b.3
Make judgment of unfeasibility
v.b
Assessment of unfeasibility of using actual inputs, actions, and outputs in tests
vi.b

from

step	10.3
cell	
page	102

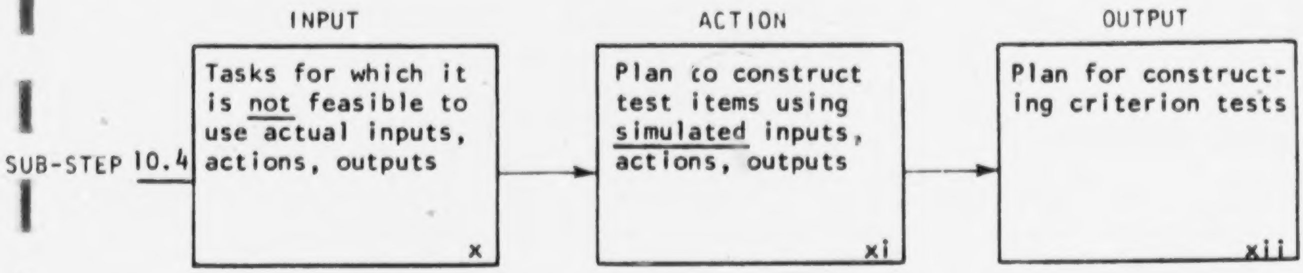
NO DETAILED ANALYSIS FOR


INPUT
ACTION
OUTPUT
SUB-STEP 10.3
Tasks for which it is feasible to use actual inputs, actions, outputs
vii
Plan to construct test items using actual inputs, actions, outputs
viii
Plans for constructing criterion tests
ix

from

step	10.4
cell	
page	102

DETAILED ANALYSIS FOR

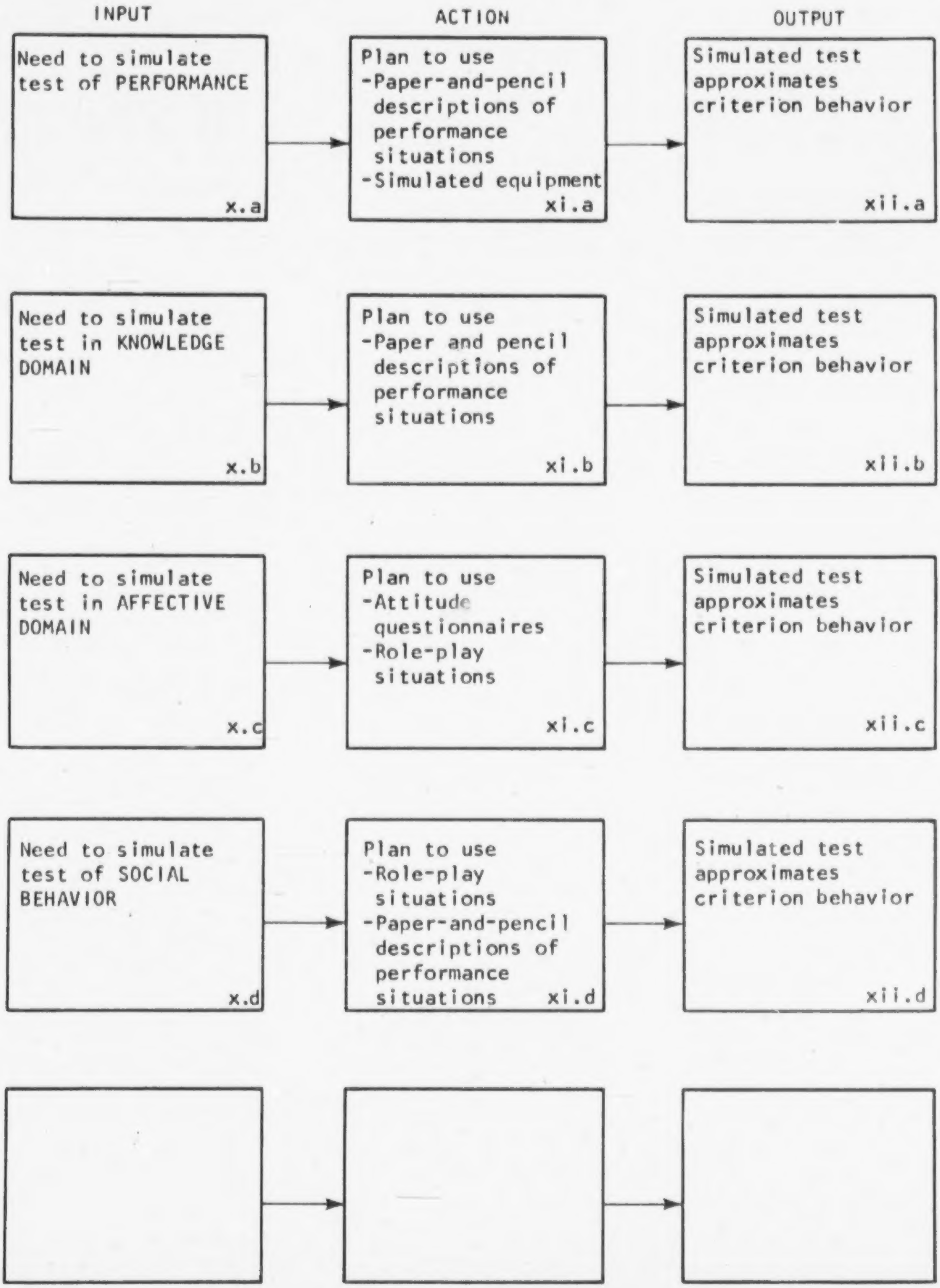

INPUT
ACTION
OUTPUT
SUB-STEP 10.4
Tasks for which it is not feasible to use actual inputs, actions, outputs
x
Plan to construct test items using simulated inputs, actions, outputs
xi
Plan for constructing criterion tests
xii

ON NEXT 1 PAGE

from

step	10.4
cell	x
page	102

MORE DETAILED DIAGRAM FOR DISCRIMINATIONS

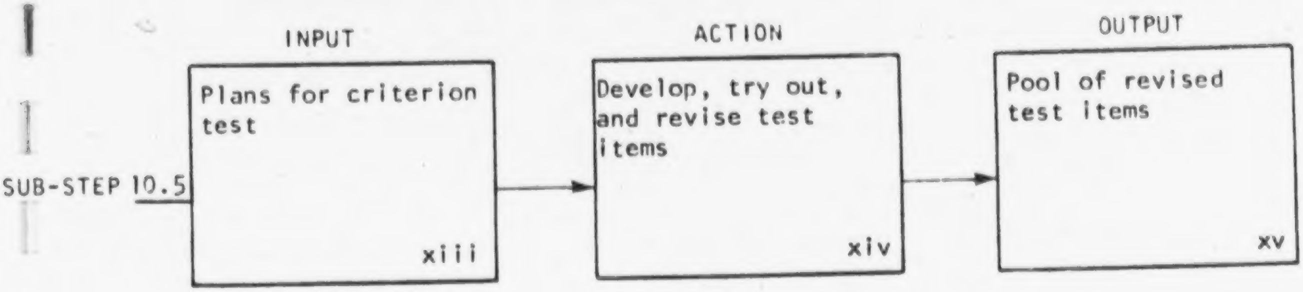


INPUT	ACTION	OUTPUT
Need to simulate test of PERFORMANCE x.a	Plan to use -Paper-and-pencil descriptions of performance situations -Simulated equipment xi.a	Simulated test approximates criterion behavior xii.a
Need to simulate test in KNOWLEDGE DOMAIN x.b	Plan to use -Paper and pencil descriptions of performance situations xi.b	Simulated test approximates criterion behavior xii.b
Need to simulate test in AFFECTIVE DOMAIN x.c	Plan to use -Attitude questionnaires -Role-play situations xi.c	Simulated test approximates criterion behavior xii.c
Need to simulate test of SOCIAL BEHAVIOR x.d	Plan to use -Role-play situations -Paper-and-pencil descriptions of performance situations xi.d	Simulated test approximates criterion behavior xii.d

from

step	10.5
cell	
page	102

DETAILED ANALYSIS FOR

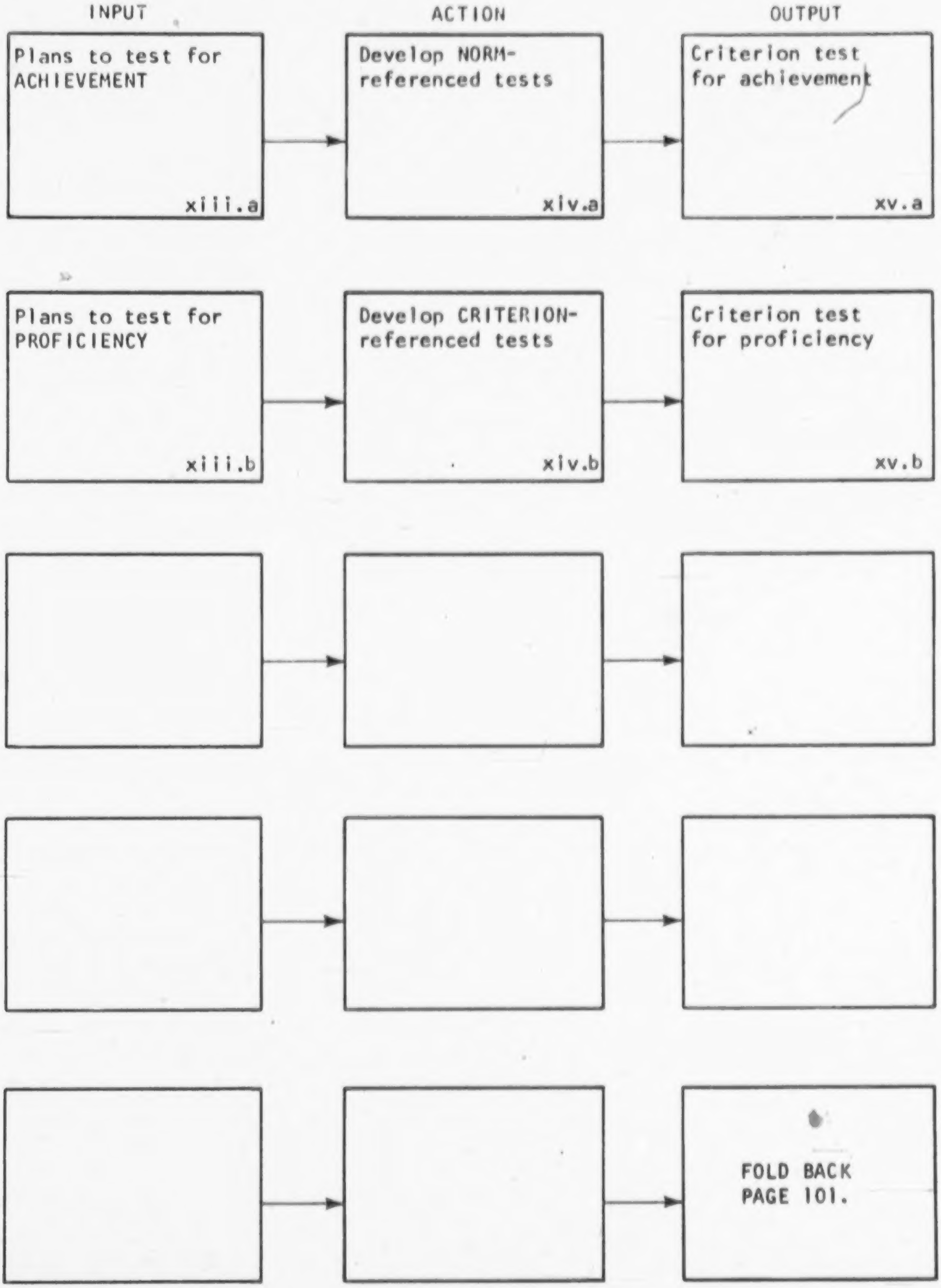

INPUT
ACTION
OUTPUT
SUB-STEP 10.5
Plans for criterion test
xiii
Develop, try out, and revise test items
xiv
Pool of revised test items
xv

ON NEXT 1 PAGE

from

step	10.5
cell	xiii
page	102

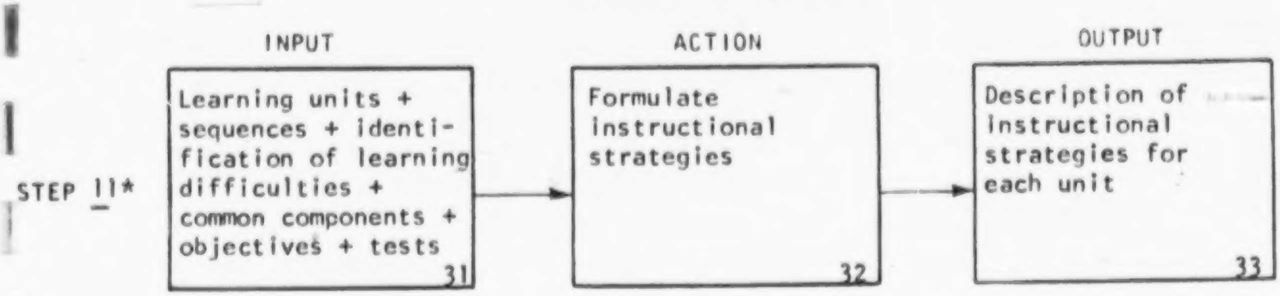
MORE DETAILED DIAGRAM FOR DISCRIMINATIONS


INPUT
ACTION
OUTPUT
Plans to test for ACHIEVEMENT
xiii.a
Develop NORM-referenced tests
xiv.a
Criterion test for achievement
xv.a
Plans to test for PROFICIENCY
xiii.b
Develop CRITERION-referenced tests
xiv.b
Criterion test for proficiency
xv.b
FOLD BACK PAGE 101.

from

step	11
cell	
page	2

DETAILED ANALYSIS FOR


INPUT
ACTION
OUTPUT
STEP 11*
Learning units + sequences + identification of learning difficulties + common components + objectives + tests
31
Formulate instructional strategies
32
Description of instructional strategies for each unit
33

*Four more detailed, self-contained sub-chains are presented on the next four pages.

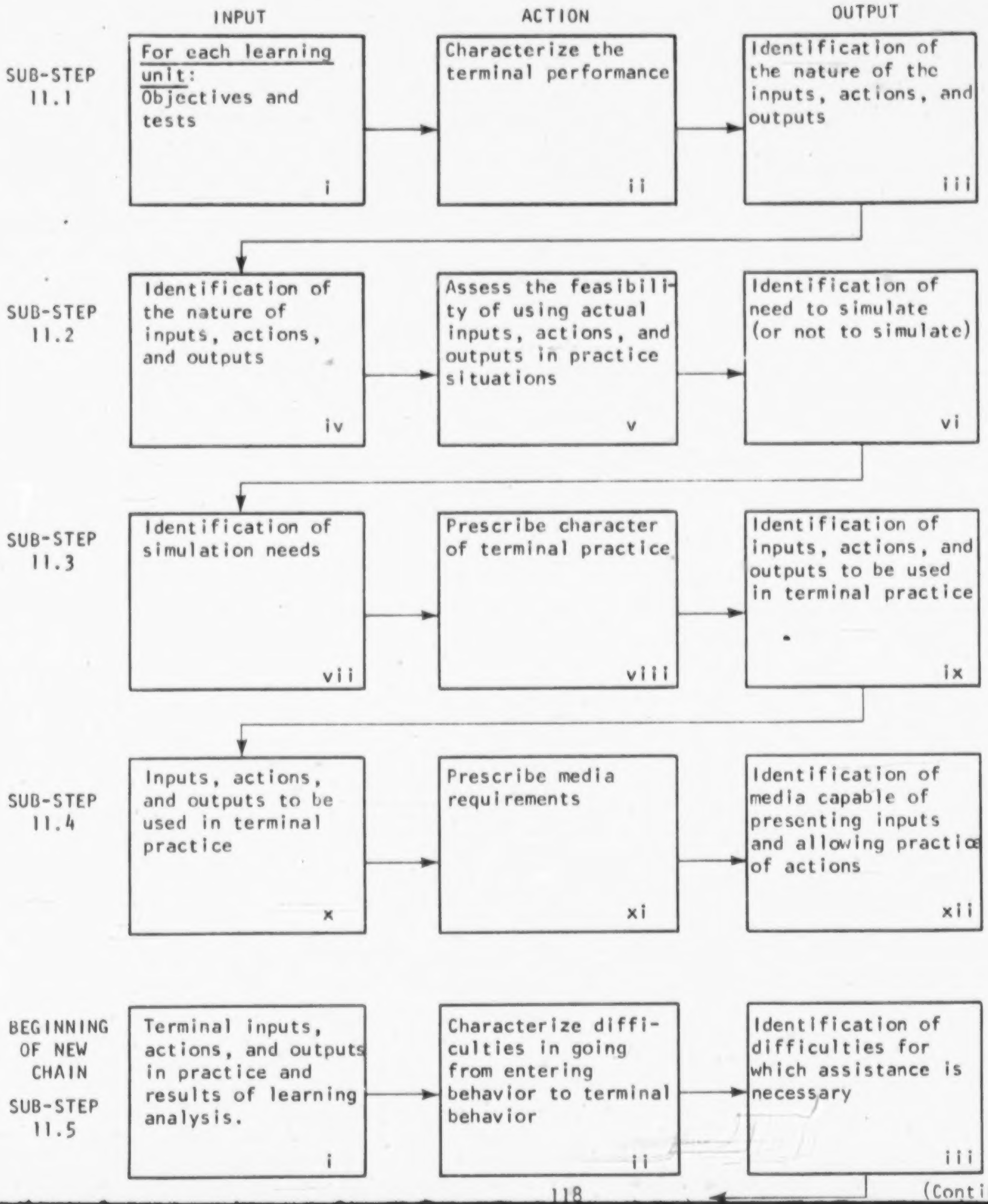
ON NEXT 58 PAGES**

**Detailed breakdowns are presented for only some of the sub-steps in each of the four sub-chains.

from

step	11
cell	
page	2

MORE DETAILED DIAGRAM FOR CHAINS (1)

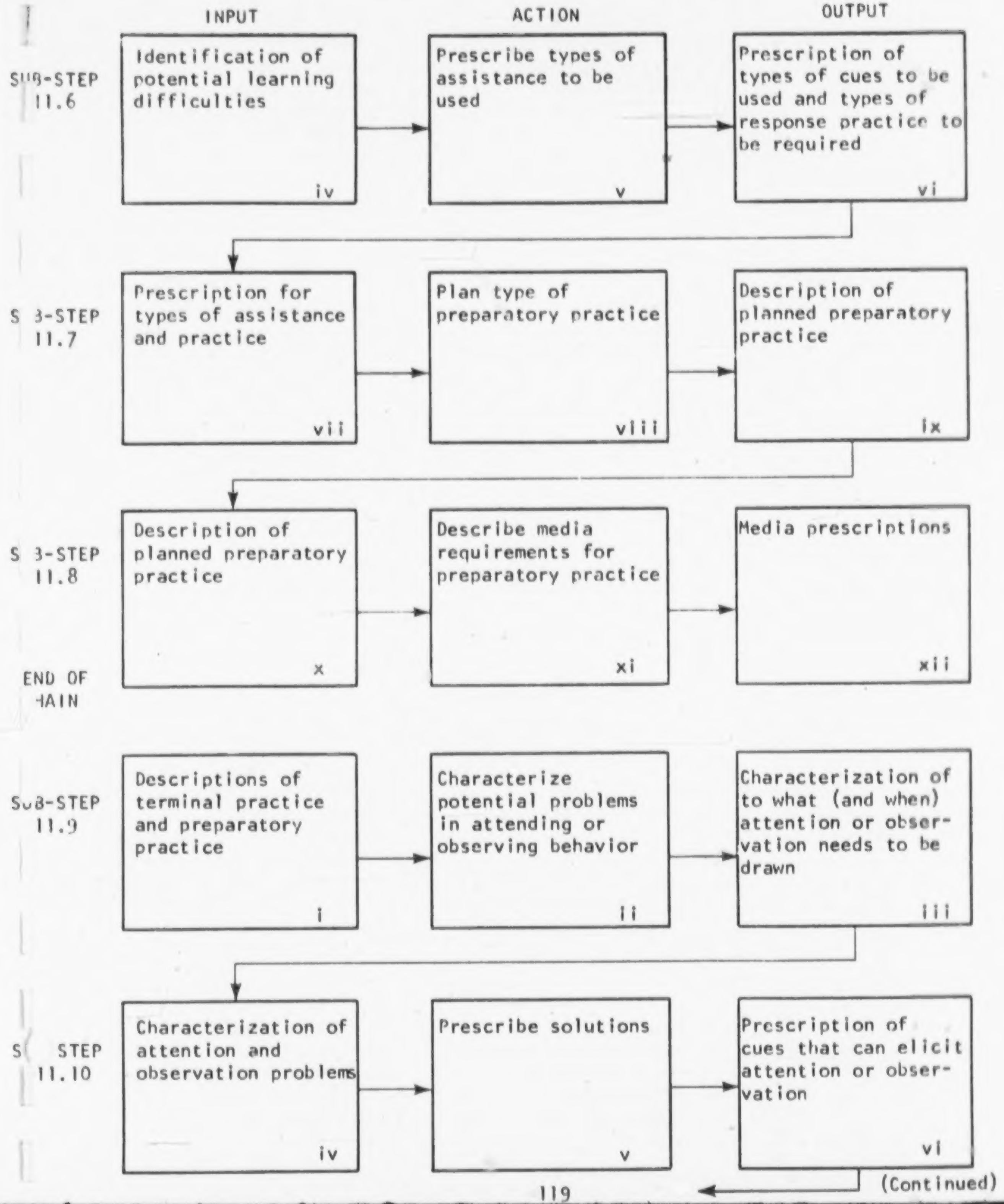

INPUT
ACTION
OUTPUT
SUB-STEP 11.1
For each learning unit: Objectives and tests
i
Characterize the terminal performance
ii
Identification of the nature of the inputs, actions, and outputs
iii
SUB-STEP 11.2
Identification of the nature of inputs, actions, and outputs
iv
Assess the feasibility of using actual inputs, actions, and outputs in practice situations
v
Identification of need to simulate (or not to simulate)
vi
SUB-STEP 11.3
Identification of simulation needs
vii
Prescribe character of terminal practice
viii
Identification of inputs, actions, and outputs to be used in terminal practice
ix
SUB-STEP 11.4
Inputs, actions, and outputs to be used in terminal practice
x
Prescribe media requirements
xi
Identification of media capable of presenting inputs and allowing practice of actions
xii
BEGINNING OF NEW CHAIN
SUB-STEP 11.5
Terminal inputs, actions, and outputs in practice and results of learning analysis.
i
Characterize difficulties in going from entering behavior to terminal behavior
ii
Identification of difficulties for which assistance is necessary
iii

(Continued)

from

step	11
cell	
page	2

MORE DETAILED DIAGRAM FOR CHAINS (2)

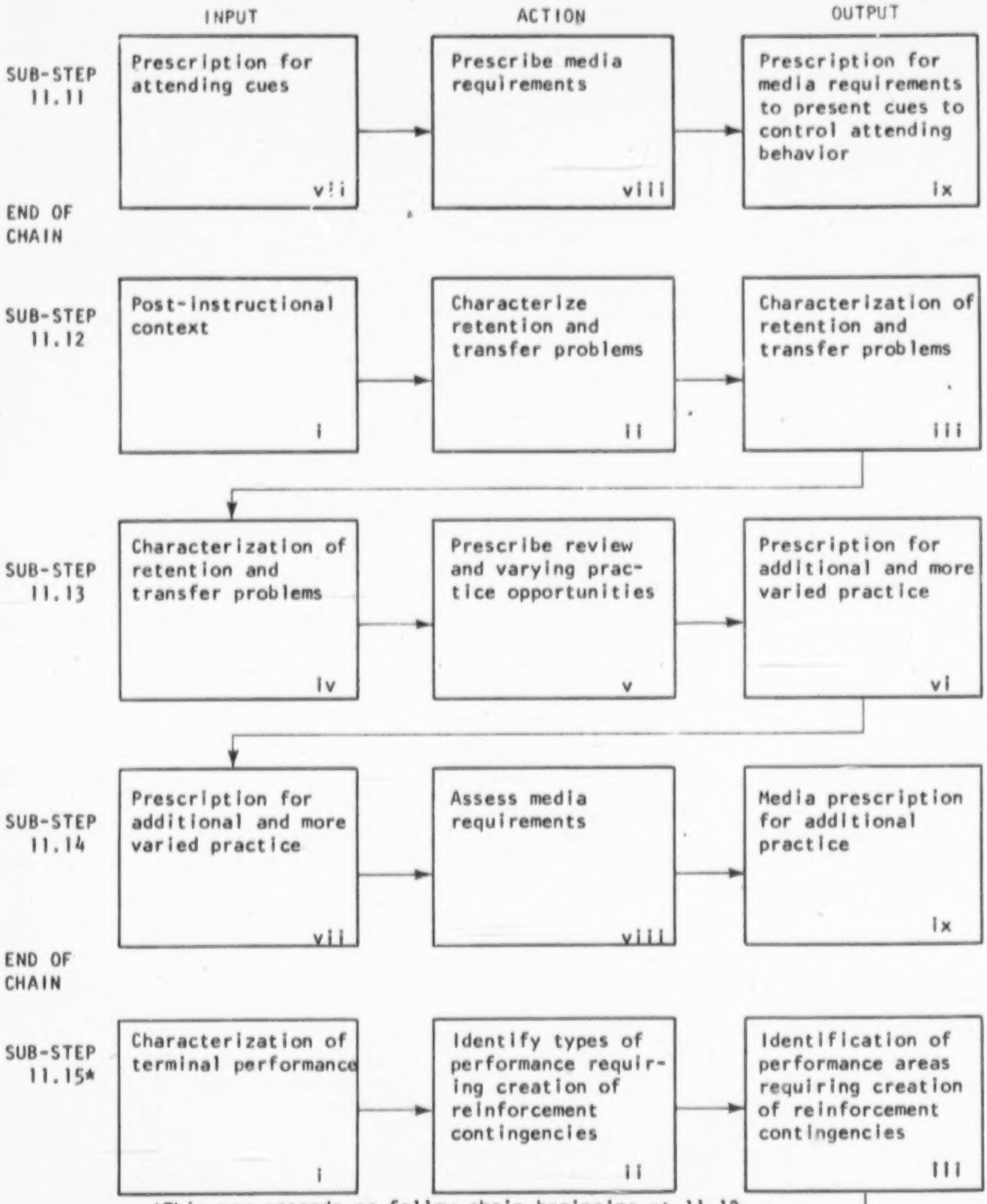


	INPUT	ACTION	OUTPUT
SUB-STEP 11.6	Identification of potential learning difficulties iv	Prescribe types of assistance to be used v	Prescription of types of cues to be used and types of response practice to be required vi
SUB-STEP 11.7	Prescription for types of assistance and practice vii	Plan type of preparatory practice viii	Description of planned preparatory practice ix
SUB-STEP 11.8	Description of planned preparatory practice x	Describe media requirements for preparatory practice xi	Media prescriptions xii
END OF CHAIN			
SUB-STEP 11.9	Descriptions of terminal practice and preparatory practice i	Characterize potential problems in attending or observing behavior ii	Characterization of to what (and when) attention or observation needs to be drawn iii
SUB-STEP 11.10	Characterization of attention and observation problems iv	Prescribe solutions v	Prescription of cues that can elicit attention or observation vi

(Continued)

from	
step	11
cell	
page	2

MORE DETAILED DIAGRAM FOR CHAINS (3)



	INPUT	ACTION	OUTPUT
SUB-STEP 11.11	Prescription for attending cues vii	Prescribe media requirements viii	Prescription for media requirements to present cues to control attending behavior ix
END OF CHAIN			
SUB-STEP 11.12	Post-instructional context i	Characterize retention and transfer problems ii	Characterization of retention and transfer problems iii
SUB-STEP 11.13	Characterization of retention and transfer problems iv	Prescribe review and varying practice opportunities v	Prescription for additional and more varied practice vi
SUB-STEP 11.14	Prescription for additional and more varied practice vii	Assess media requirements viii	Media prescription for additional practice ix
END OF CHAIN			
SUB-STEP 11.15*	Characterization of terminal performance i	Identify types of performance requiring creation of reinforcement contingencies ii	Identification of performance areas requiring creation of reinforcement contingencies iii

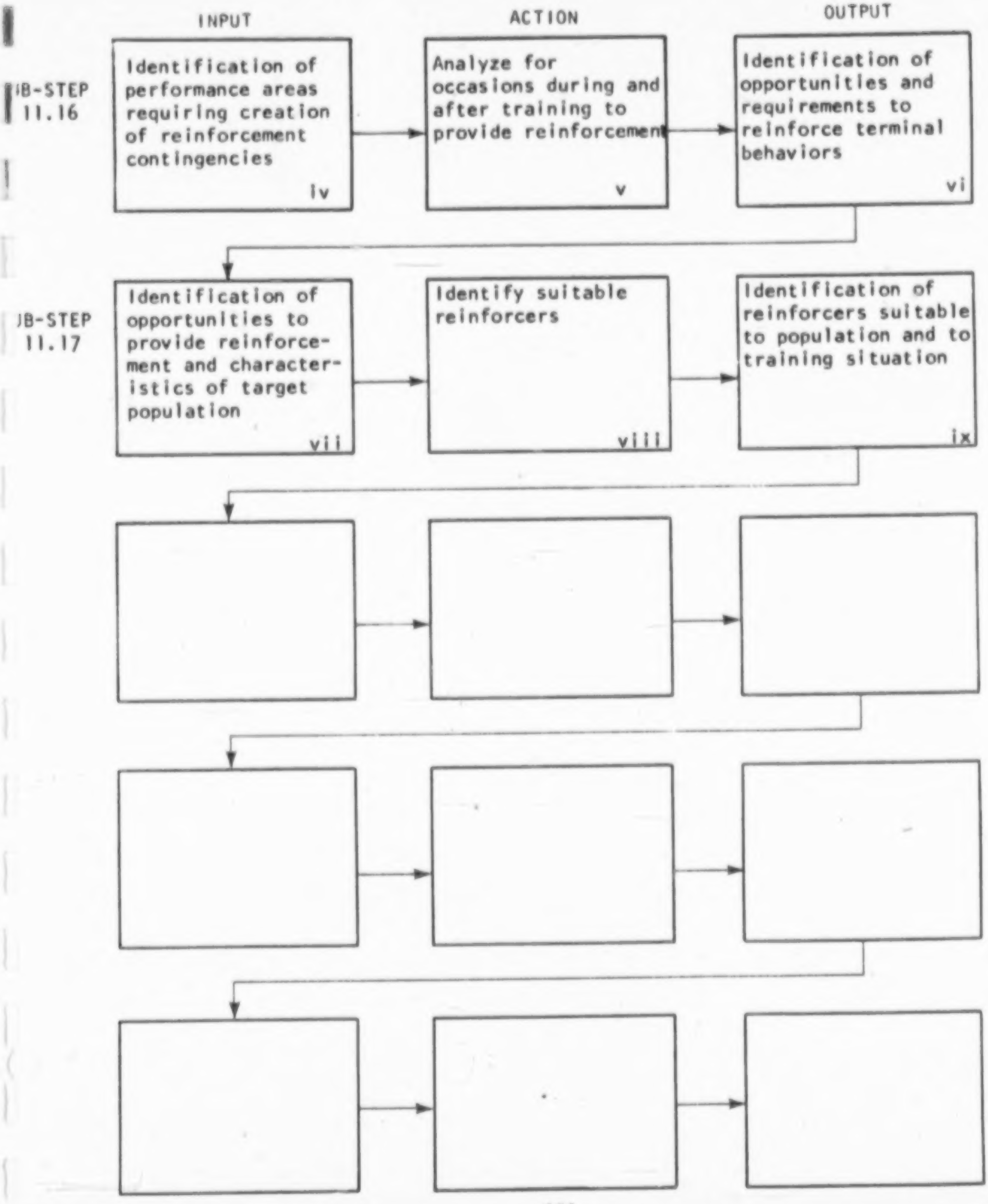
*This may precede or follow chain beginning at 11.12

(Continued)

from

step	11
cell	
page	2

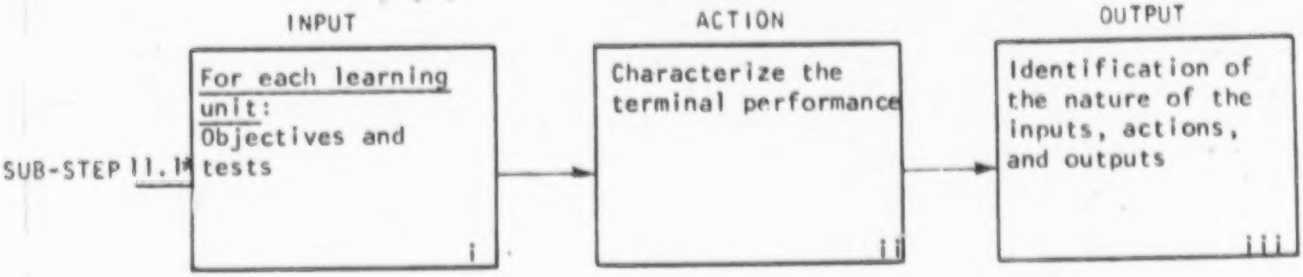
MORE DETAILED DIAGRAM FOR CHAINS (4)


INPUT
ACTION
OUTPUT
IB-STEP 11.16
Identification of performance areas requiring creation of reinforcement contingencies iv
Analyze for occasions during and after training to provide reinforcement v
Identification of opportunities and requirements to reinforce terminal behaviors vi
JB-STEP 11.17
Identification of opportunities to provide reinforcement and characteristics of target population vii
Identify suitable reinforcers viii
Identification of reinforcers suitable to population and to training situation ix

from

step	11.1
cell	i
page	118

NO DETAILED ANALYSIS FOR

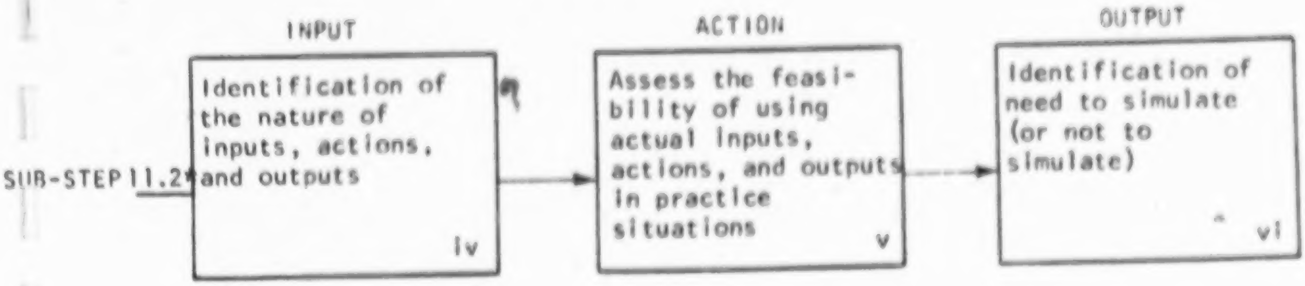

INPUT
ACTION
OUTPUT
SUB-STEP 11.1*
For each learning unit:
Objectives and tests
i
Characterize the terminal performance
ii
Identification of the nature of the inputs, actions, and outputs
iii

*Comparable to Sub-step 10.1, page 103.

from

step	11.2
cell	iv
page	118

NO DETAILED ANALYSIS FOR

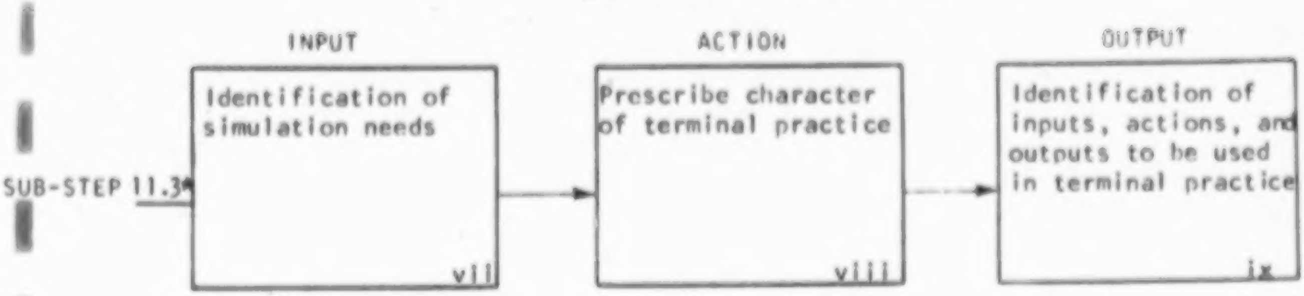

INPUT
ACTION
OUTPUT
SUB-STEP 11.2*
Identification of the nature of inputs, actions, and outputs
iv
Assess the feasibility of using actual inputs, actions, and outputs in practice situations
v
Identification of need to simulate (or not to simulate)
vi

*Comparable to Sub-step 10.2, page 107.

from

step	11.3
cell	
page	118

NO DETAILED ANALYSIS FOR

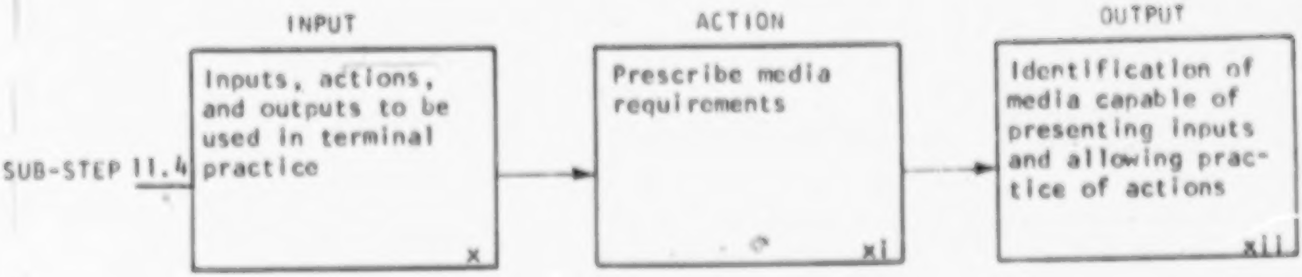

INPUT
ACTION
OUTPUT
SUB-STEP 11.3*
Identification of simulation needs
vii
Prescribe character of terminal practice
viii
Identification of inputs, actions, and outputs to be used in terminal practice
ix

*Comparable to Sub-step 10.4, page 114.

from

step	11.4
cell	
page	118

DETAILED ANALYSIS FOR

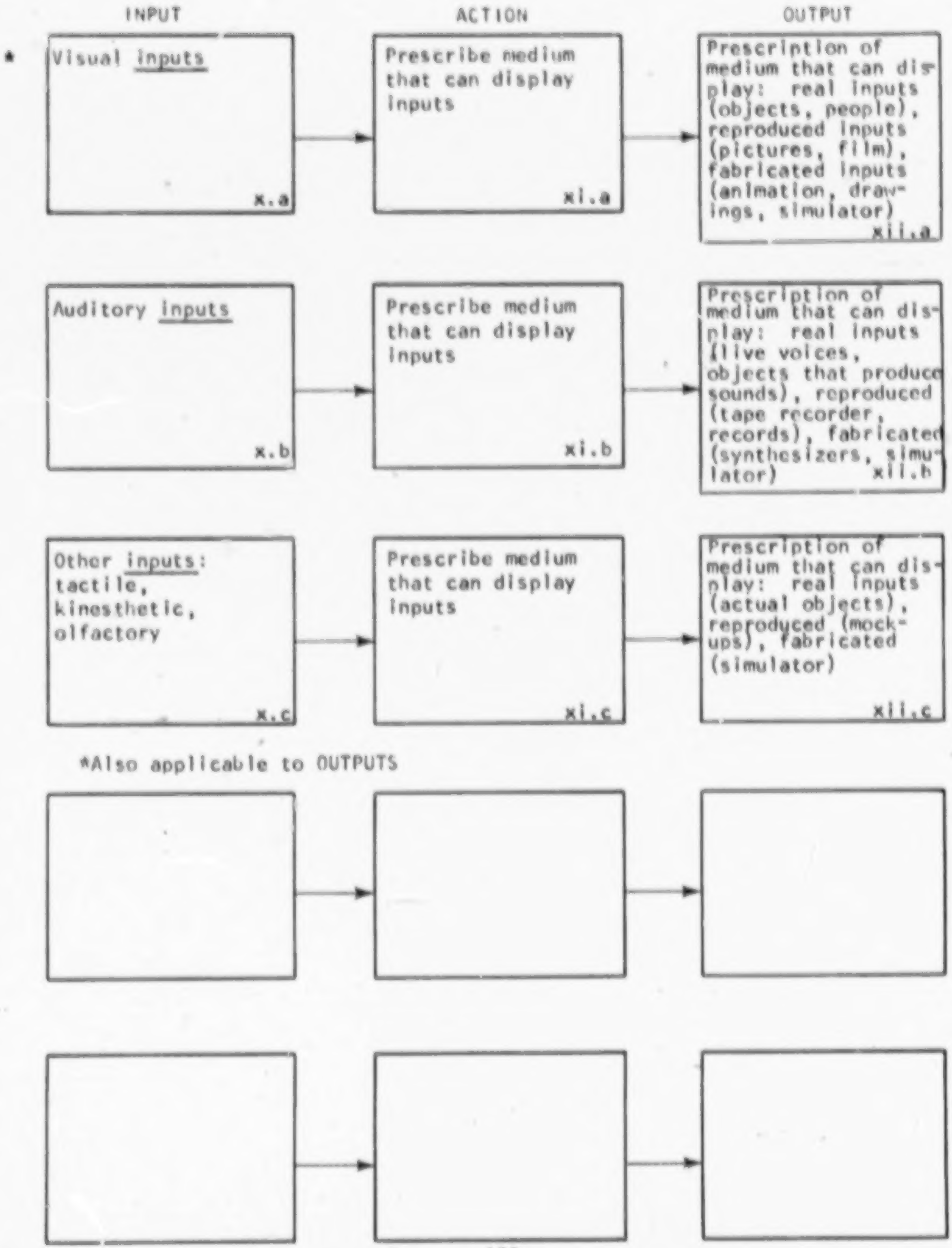

INPUT
ACTION
OUTPUT
SUB-STEP 11.4
Inputs, actions, and outputs to be used in terminal practice
x
Prescribe media requirements
xi
Identification of media capable of presenting inputs and allowing practice of actions
xii

ON NEXT 6 PAGES

from

step	11.4
cell	x
page	118

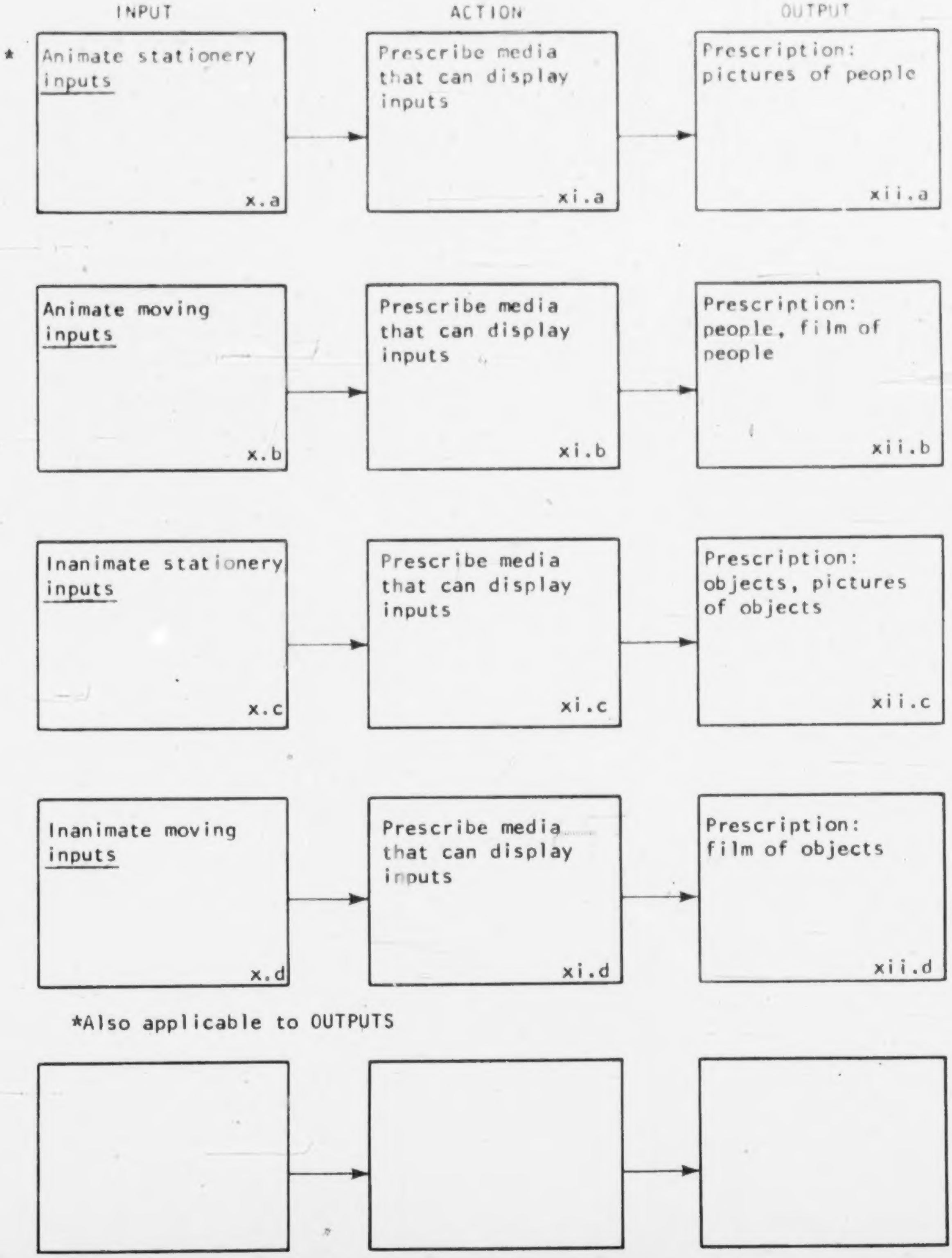
MORE DETAILED DIAGRAM FOR DISCRIMINATIONS (1)


INPUT
ACTION
OUTPUT
*
Visual inputs
x.a
Prescribe medium that can display inputs
xi.a
Prescription of medium that can display: real inputs (objects, people), reproduced inputs (pictures, film), fabricated inputs (animation, drawings, simulator)
xii.a
Auditory inputs
x.b
Prescribe medium that can display inputs
xi.b
Prescription of medium that can display: real inputs (live voices, objects that produce sounds), reproduced (tape recorder, records), fabricated (synthesizers, simulator)
xii.b
Other inputs: tactile, kinesthetic, olfactory
x.c
Prescribe medium that can display inputs
xi.c
Prescription of medium that can display: real inputs (actual objects), reproduced (mock-ups), fabricated (simulator)
xii.c
*Also applicable to OUTPUTS

from

step	11.4
cell	x
page	118

MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS (2)

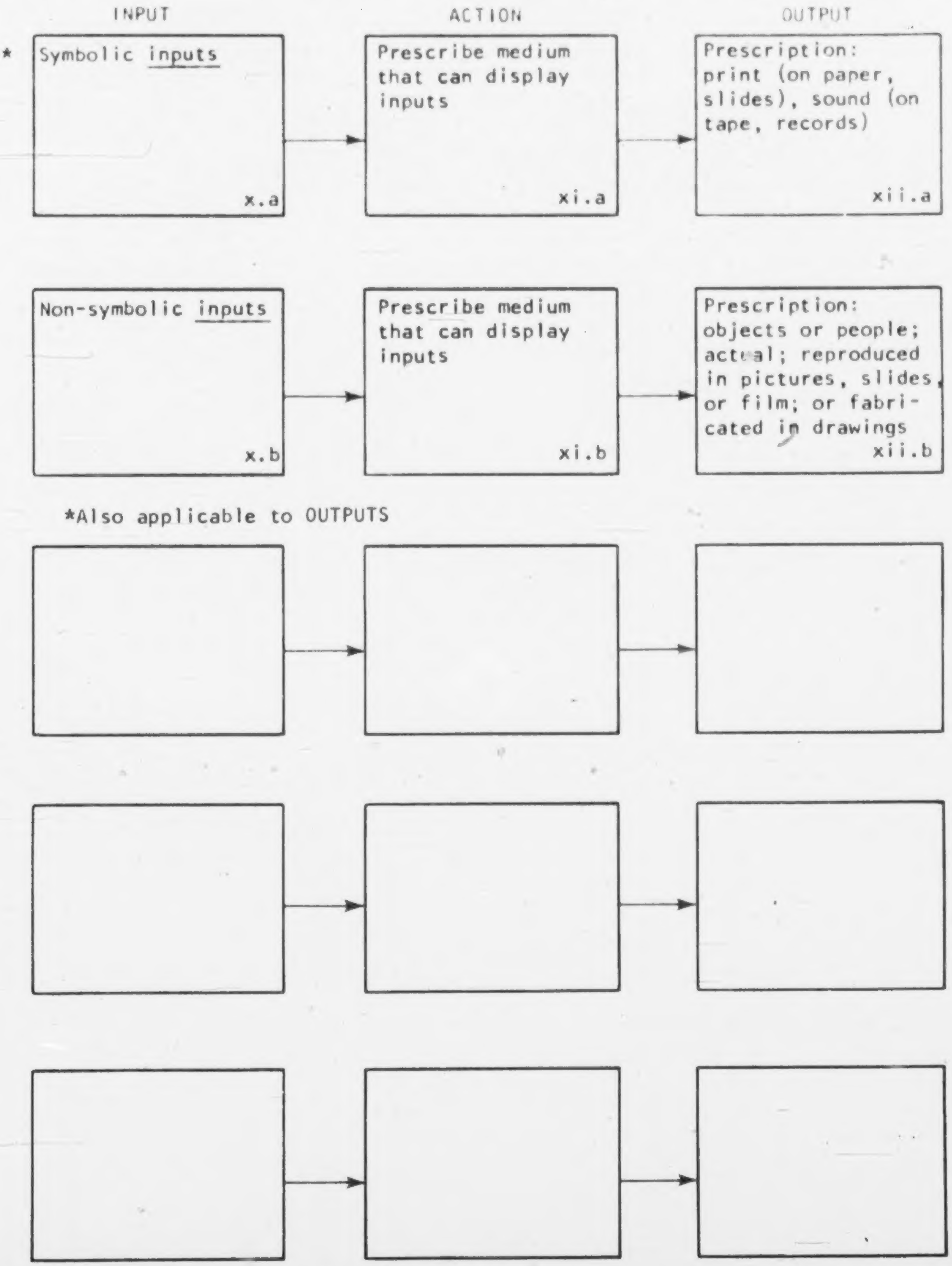

INPUT
ACTION
OUTPUT
*
Animate stationery inputs
x.a
Prescribe media that can display inputs
xi.a
Prescription: pictures of people
xii.a
Animate moving inputs
x.b
Prescribe media that can display inputs
xi.b
Prescription: people, film of people
xii.b
Inanimate stationery inputs
x.c
Prescribe media that can display inputs
xi.c
Prescription: objects, pictures of objects
xii.c
Inanimate moving inputs
x.d
Prescribe media that can display inputs
xi.d
Prescription: film of objects
xii.d

*Also applicable to OUTPUTS

from

step	11.4
cell	x
page	118

MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS (3)

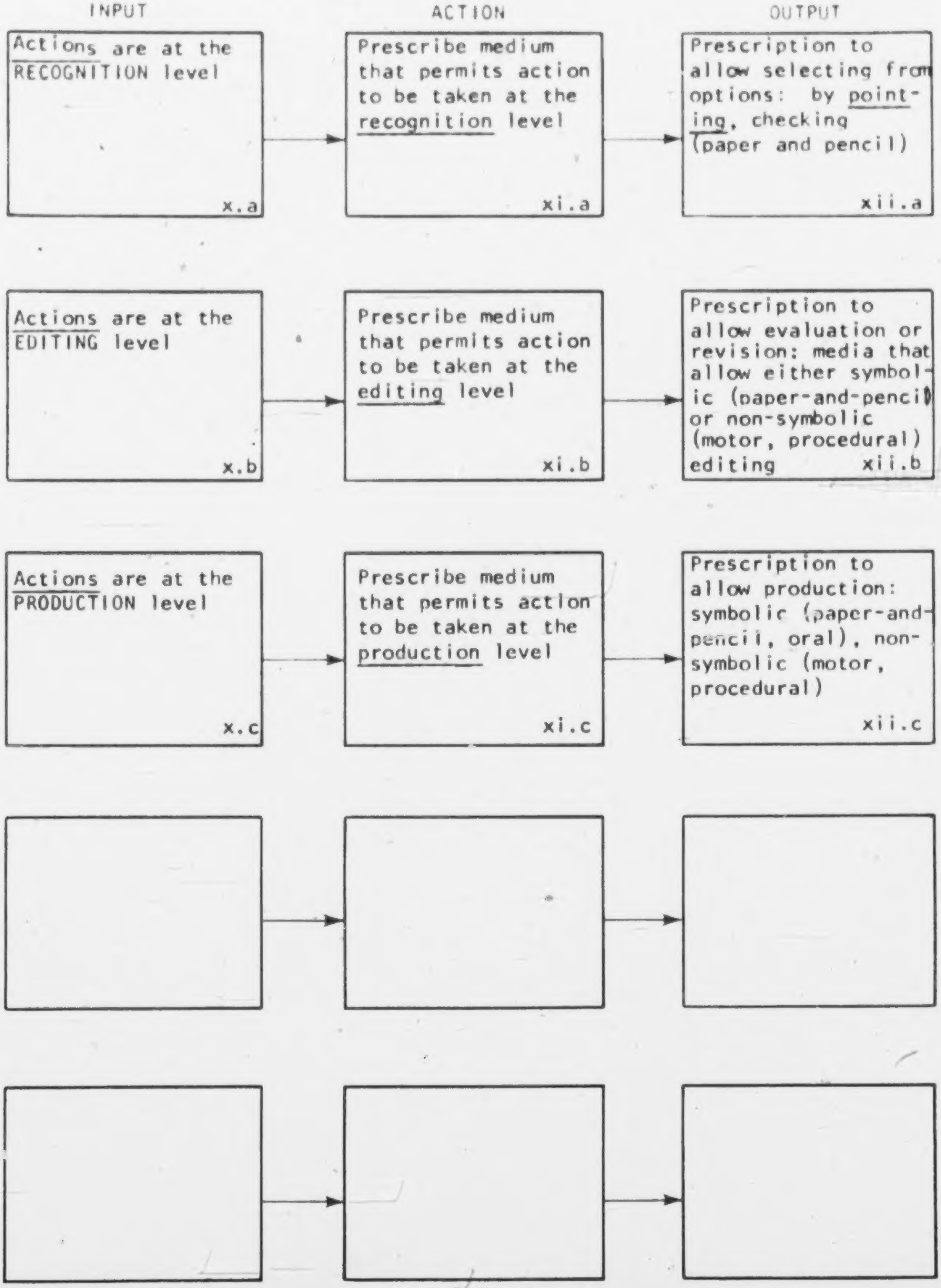

INPUT
ACTION
OUTPUT
*
Symbolic inputs
x.a
Prescribe medium that can display inputs
xi.a
Prescription: print (on paper, slides), sound (on tape, records)
xii.a
Non-symbolic inputs
x.b
Prescribe medium that can display inputs
xi.b
Prescription: objects or people; actual; reproduced in pictures, slides, or film; or fabricated in drawings
xii.b

*Also applicable to OUTPUTS

from

step	11.4
cell	x
page	118

MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS (4)



INPUT — ACTION — OUTPUT

Actions are at the RECOGNITION level x.a → Prescribe medium that permits action to be taken at the recognition level xi.a → Prescription to allow selecting from options: by pointing, checking (paper and pencil) xii.a

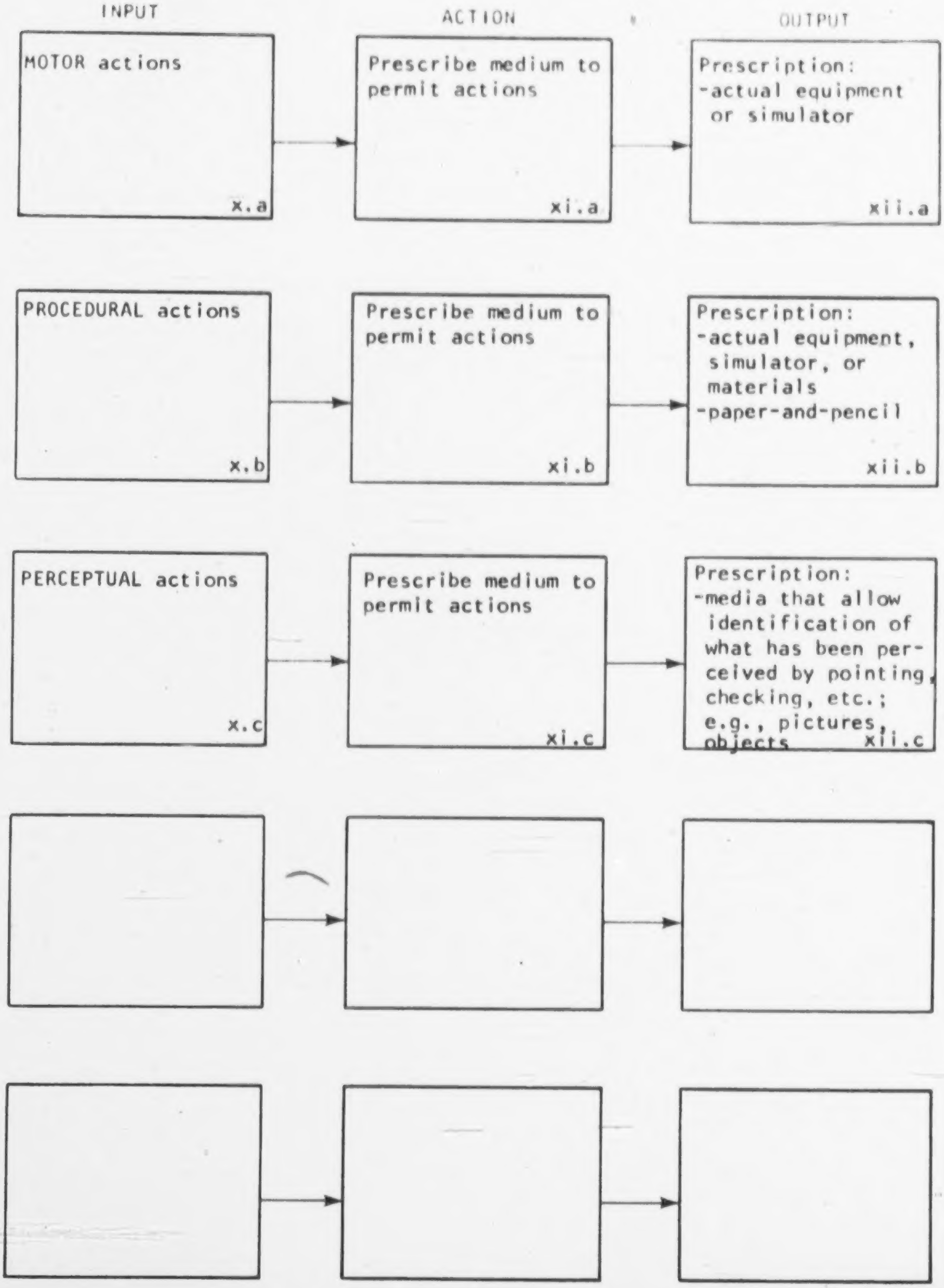
Actions are at the EDITING level x.b → Prescribe medium that permits action to be taken at the editing level xi.b → Prescription to allow evaluation or revision: media that allow either symbolic (paper-and-pencil) or non-symbolic (motor, procedural) editing xii.b

Actions are at the PRODUCTION level x.c → Prescribe medium that permits action to be taken at the production level xi.c → Prescription to allow production: symbolic (paper-and-pencil, oral), non-symbolic (motor, procedural) xii.c

from

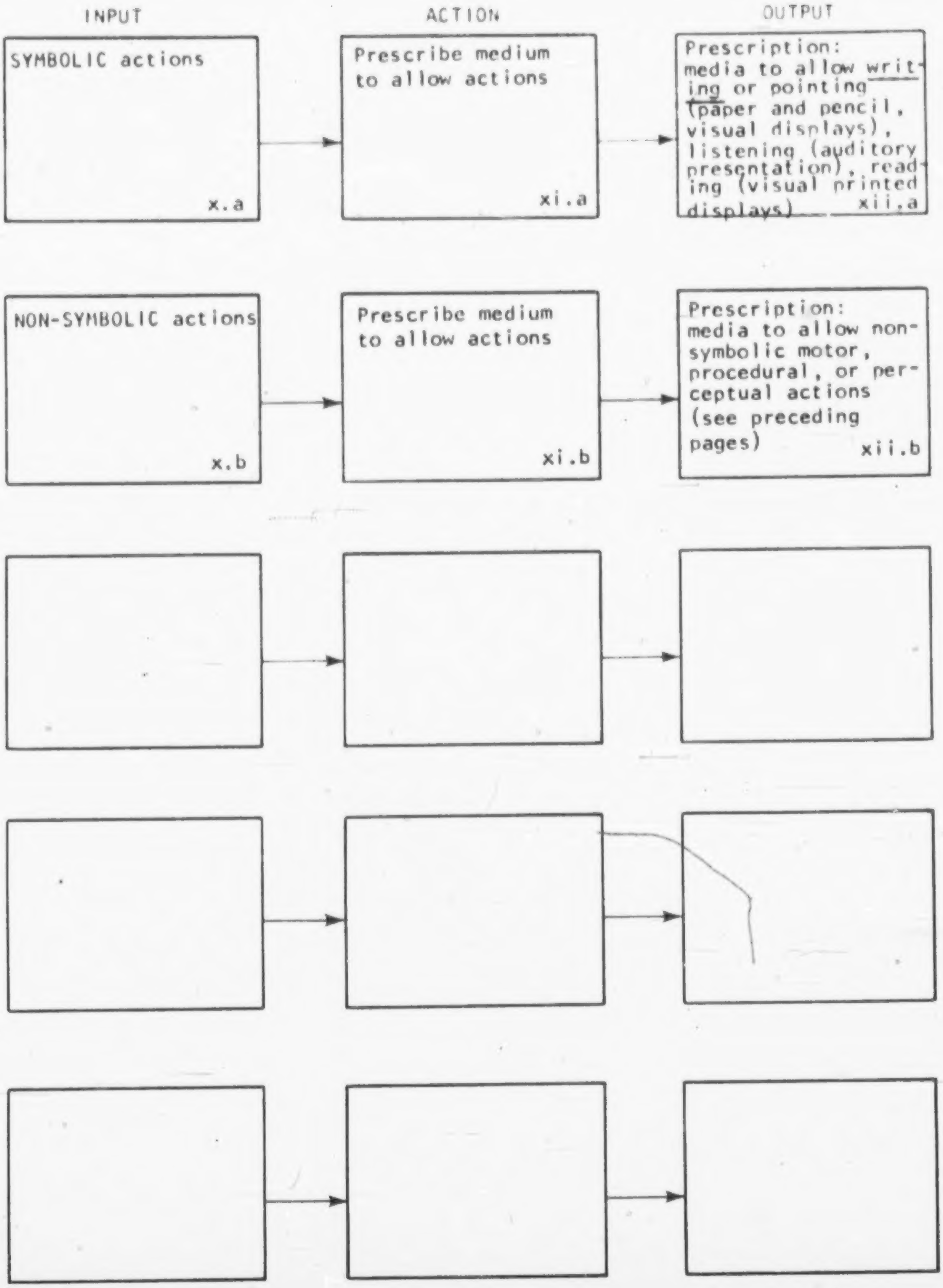
step	11.4
cell	x
page	118

MORE DETAILED DIAGRAM FOR DISCRIMINATIONS (5)


INPUT
ACTION
OUTPUT
MOTOR actions
x.a
Prescribe medium to permit actions
xi.a
Prescription: -actual equipment or simulator
xii.a
PROCEDURAL actions
x.b
Prescribe medium to permit actions
xi.b
Prescription: -actual equipment, simulator, or materials -paper-and-pencil
xii.b
PERCEPTUAL actions
x.c
Prescribe medium to permit actions
xi.c
Prescription: -media that allow identification of what has been perceived by pointing, checking, etc.; e.g., pictures, objects
xii.c

from	
step	11.4
cell	x
page	118

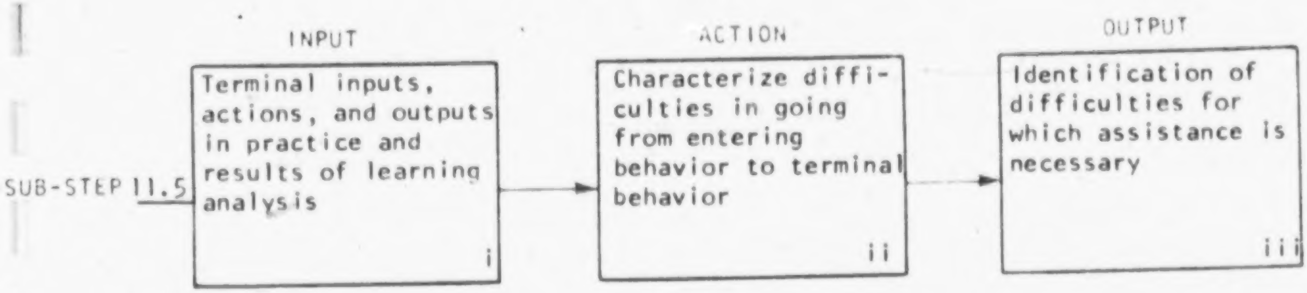
MORE DETAILED DIAGRAM FOR DISCRIMINATIONS (6)


INPUT
ACTION
OUTPUT
SYMBOLIC actions
x.a
Prescribe medium to allow actions
xi.a
Prescription: media to allow writing or pointing (paper and pencil, visual displays), listening (auditory presentation), reading (visual printed displays)
xii.a
NON-SYMBOLIC actions
x.b
Prescribe medium to allow actions
xi.b
Prescription: media to allow non-symbolic motor, procedural, or perceptual actions (see preceding pages)
xii.b

from

step	11.5
cell	
page	118

NO DETAILED ANALYSIS FOR*

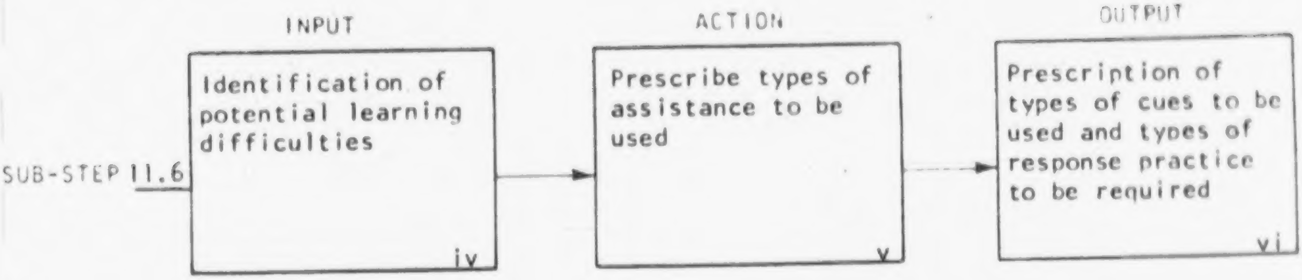

INPUT
ACTION
OUTPUT
SUB-STEP 11.5
Terminal inputs, actions, and outputs in practice and results of learning analysis
i
Characterize difficulties in going from entering behavior to terminal behavior
ii
Identification of difficulties for which assistance is necessary
iii

*See Step 8 for the analysis of learning difficulties

from

step	11.6
cell	iv
page	119

DETAILED ANALYSIS FOR


INPUT
ACTION
OUTPUT
SUB-STEP 11.6
Identification of potential learning difficulties
iv
Prescribe types of assistance to be used
v
Prescription of types of cues to be used and types of response practice to be required
vi

ON NEXT 5 PAGES

from

step	11.6
cell	iv
page	119

MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS

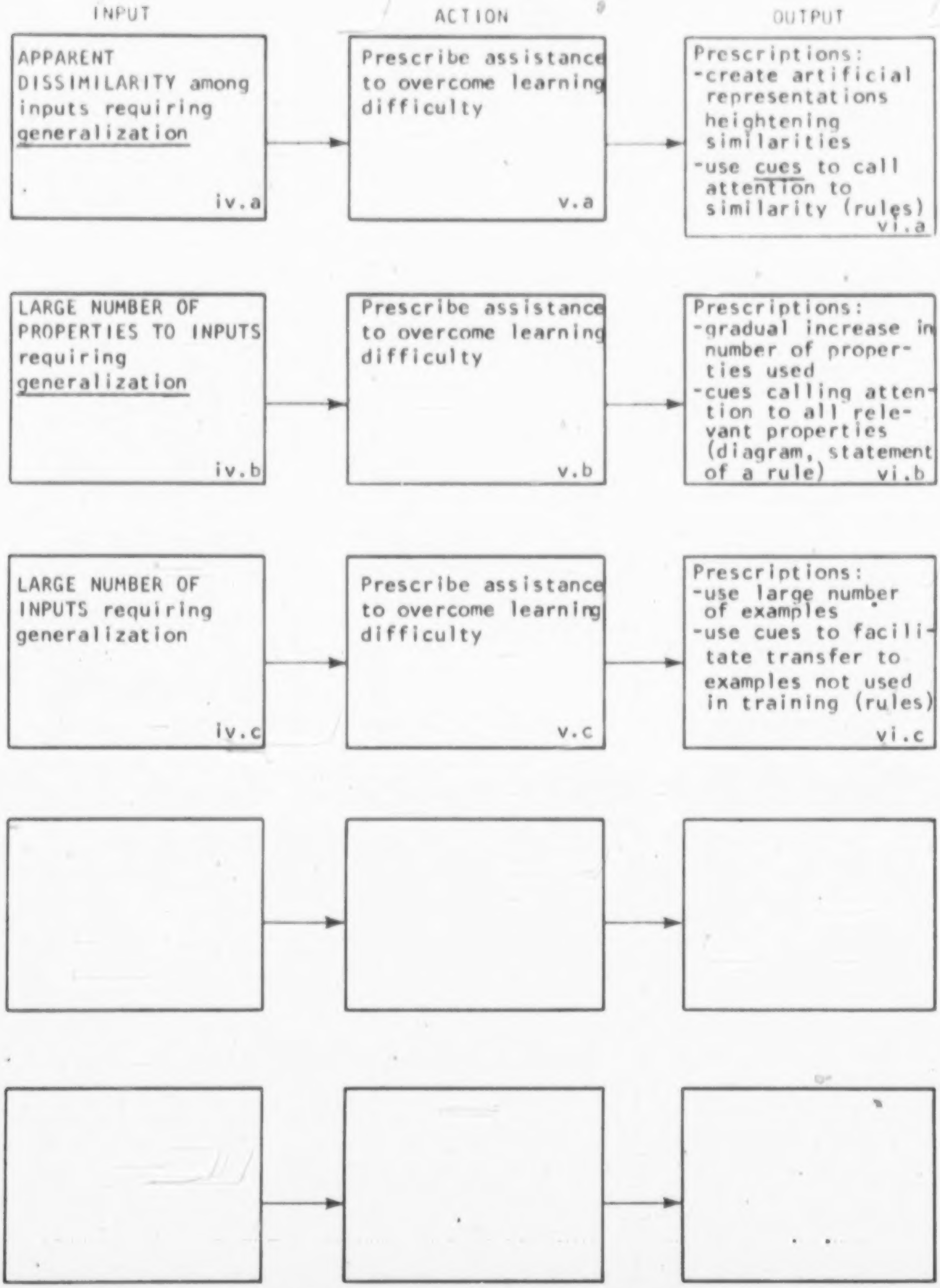
INPUT	ACTION	OUTPUT
SIMILARITY among inputs to be discriminated iv.a	Prescribe assistance to overcome learning difficulties v.a	Prescriptions: -practice at recognition level -gradual progression in paired comparisons -cues calling attention to differences vi.a
LARGE NUMBER OF INPUT PROPERTIES forming the basis for discriminations iv.b	Prescribe assistance to overcome learning difficulties v.b	Prescriptions: -gradual increase in number of properties used -cues calling attention to all relevant properties (diagram, statement of a rule) vi.b
LARGE NUMBER OF INPUTS to be discriminated iv.c	Prescribe assistance to overcome learning difficulties v.c	Prescriptions: -Presentation of all inputs simultaneously* (big picture diagram) -cues calling attention to differences (rules) vi.c

*Useful for all discrimination problems

from

step	11.6
cell	iv
page	119

MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS (2)



INPUT	ACTION	OUTPUT
APPARENT DISSIMILARITY among inputs requiring generalization iv.a	Prescribe assistance to overcome learning difficulty v.a	Prescriptions: -create artificial representations heightening similarities -use cues to call attention to similarity (rules) vi.a
LARGE NUMBER OF PROPERTIES TO INPUTS requiring generalization iv.b	Prescribe assistance to overcome learning difficulty v.b	Prescriptions: -gradual increase in number of properties used -cues calling attention to all relevant properties (diagram, statement of a rule) vi.b
LARGE NUMBER OF INPUTS requiring generalization iv.c	Prescribe assistance to overcome learning difficulty v.c	Prescriptions: -use large number of examples -use cues to facilitate transfer to examples not used in training (rules) vi.c

from

step	11.6
cell	iv
page	119

MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS (3)

INPUT	ACTION	OUTPUT
LARGE NUMBER of input-action associations to be learned iv.a	Prescribe assistance to overcome learning difficulty v.a	Prescriptions: -provide cues to assist learner to identify which action goes with which input (e.g., mneumonics) vi.a
STRONG EXISTING ASSOCIATION between input and another action iv.b	Prescribe assistance to overcome learning difficulty v.b	Prescriptions: -provide recognition practice in which two competing actions are contrasting options -use cues to call attention to competition vi.b

from

step	11.6
cell	iv
page	119

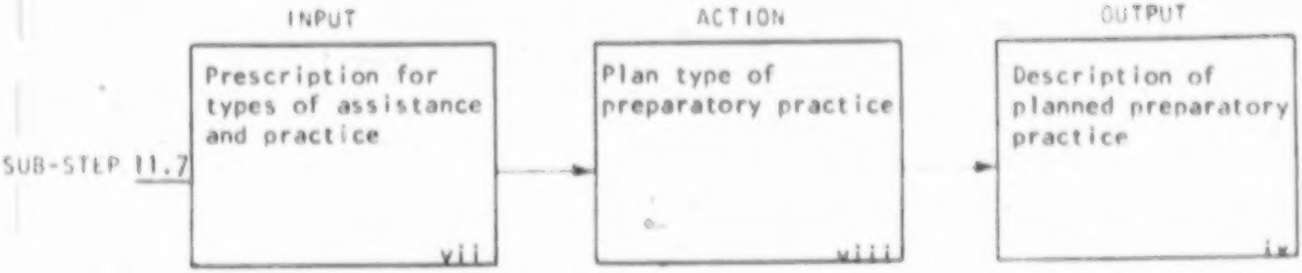
MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS

INPUT	ACTION	OUTPUT
LONG SEQUENCE in chain to be learned iv.a	Prescribe assistance to overcome learning difficulty v.a	Prescriptions: -break up chain into parts -decide on forward or backward order in teaching parts -use cues (model performance, job aids) vi.a
SIMILARITY AMONG OUTPUTS in different parts of chain to be learned iv.b	Prescribe assistance to overcome learning difficulty v.b	Prescriptions: -provide practice in discriminating among similar outputs vi.b
STRONG EXISTING ASSOCIATION between output (in chain) and another action iv.c	Prescribe assistance to overcome learning difficulty v.c	Prescriptions: -provide practice recognizing difference between alternative actions -use cues to prompt correct action vi.c

from

step	11.7
cell	
page	119

DETAILED ANALYSIS FOR

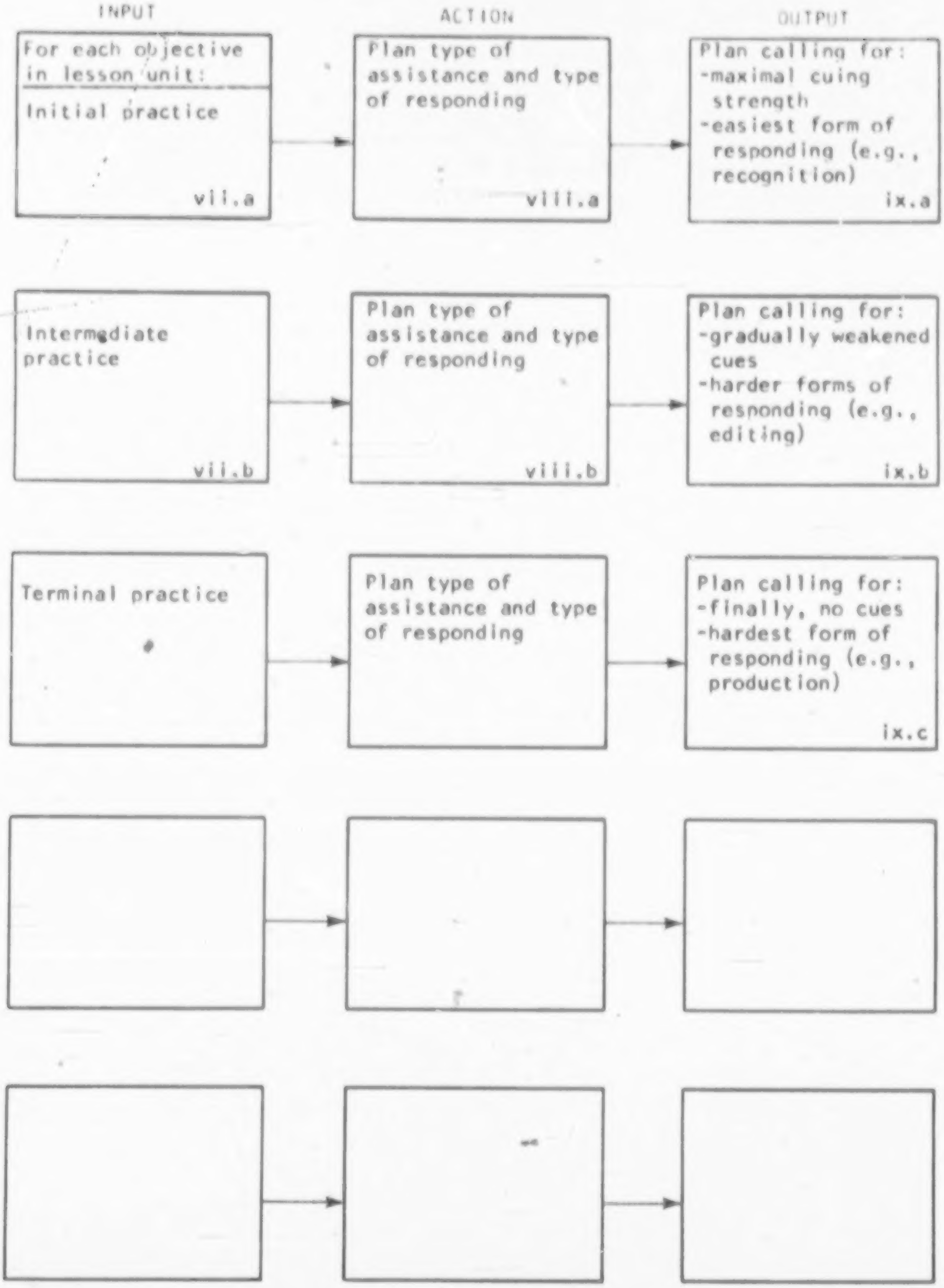

INPUT
ACTION
OUTPUT
SUB-STEP 11.7
Prescription for types of assistance and practice
vii
Plan type of preparatory practice
viii
Description of planned preparatory practice
ix

ON NEXT 3 PAGES

from

step	11.7
cell	vii
page	119

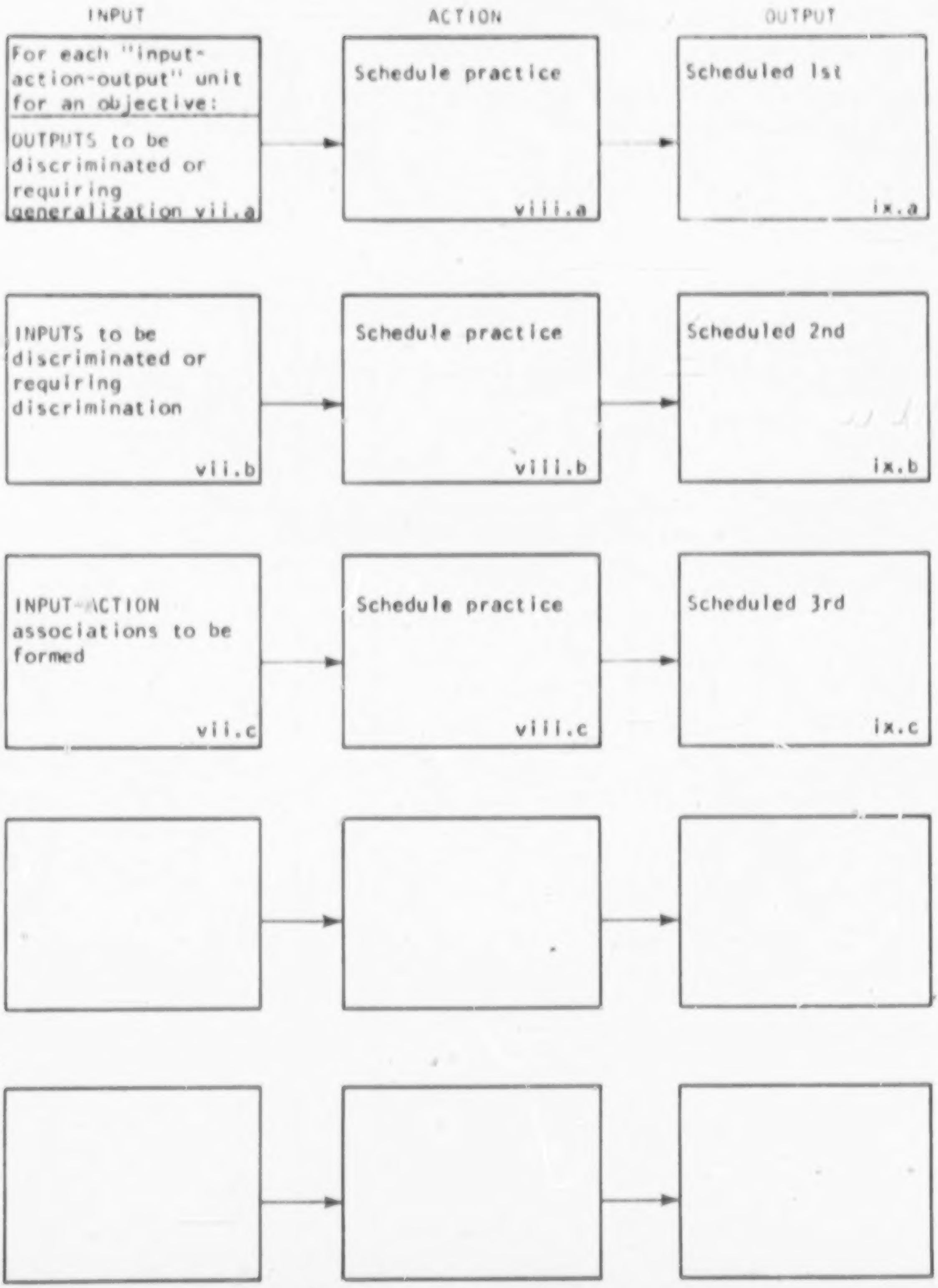
MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS (1)


INPUT
ACTION
OUTPUT
For each objective in lesson unit:
Initial practice
vii.a
Plan type of assistance and type of responding
viii.a
Plan calling for:
-maximal cuing strength
-easiest form of responding (e.g., recognition)
ix.a
Intermediate practice
vii.b
Plan type of assistance and type of responding
viii.b
Plan calling for:
-gradually weakened cues
-harder forms of responding (e.g., editing)
ix.b
Terminal practice
Plan type of assistance and type of responding
Plan calling for:
-finally, no cues
-hardest form of responding (e.g., production)
ix.c

from

step	11.7
cell	vii
page	119

MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS (2)

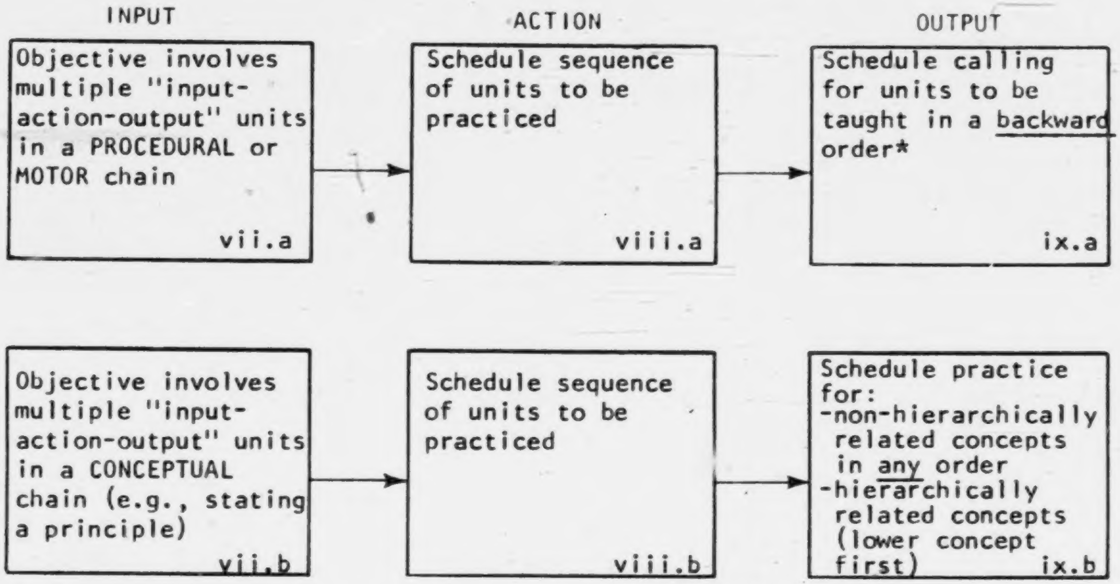


INPUT	ACTION	OUTPUT
For each "input-action-output" unit for an objective: OUTPUTS to be discriminated or requiring generalization vii.a	Schedule practice viii.a	Scheduled 1st ix.a
INPUTS to be discriminated or requiring discrimination vii.b	Schedule practice viii.b	Scheduled 2nd ix.b
INPUT-ACTION associations to be formed vii.c	Schedule practice viii.c	Scheduled 3rd ix.c

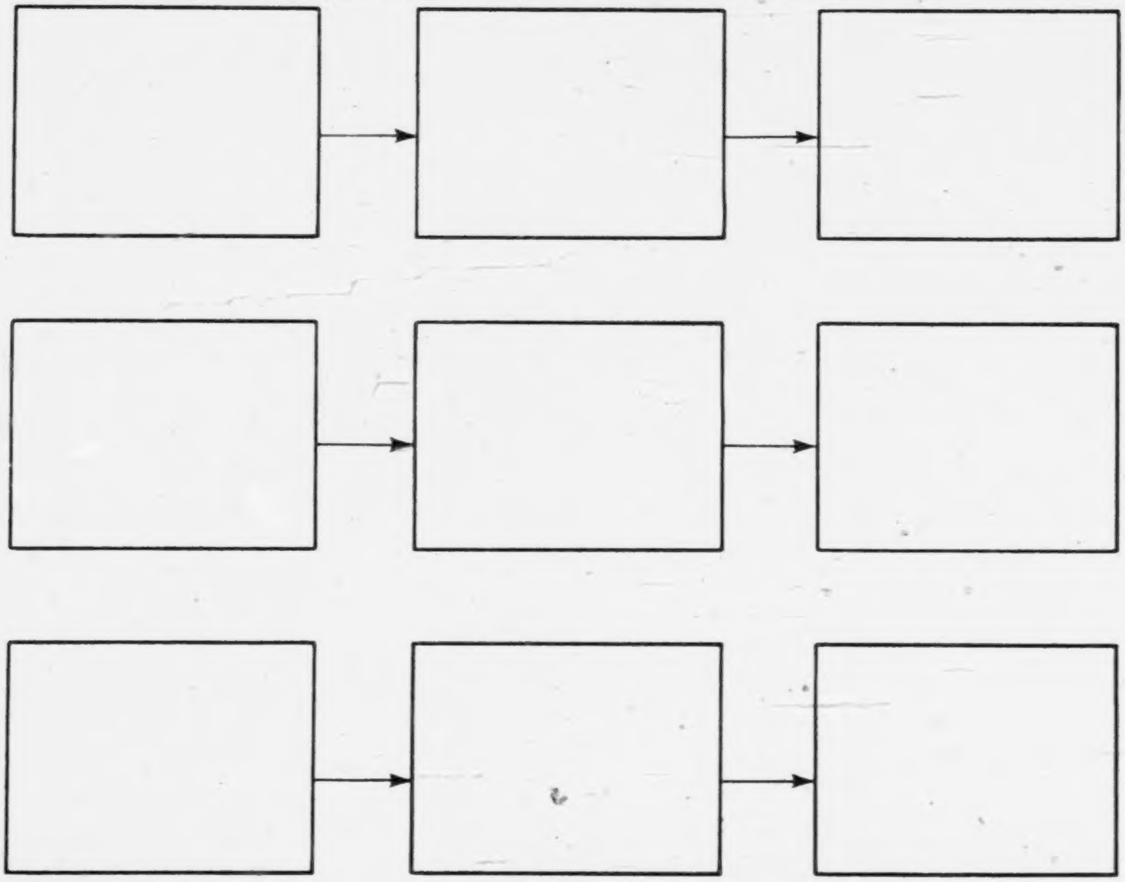
from

step	11.7
cell	vii
page	119

MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS (3)


INPUT
ACTION
OUTPUT
Objective involves multiple "input-action-output" units in a PROCEDURAL or MOTOR chain
vii.a
Schedule sequence of units to be practiced
viii.a
Schedule calling for units to be taught in a backward order*
ix.a
Objective involves multiple "input-action-output" units in a CONCEPTUAL chain (e.g., stating a principle)
vii.b
Schedule sequence of units to be practiced
viii.b
Schedule practice for:
-non-hierarchically related concepts in any order
-hierarchically related concepts (lower concept first)
ix.b

*There are theoretical reasons for this recommendation; there are as yet insufficient data supporting a forward or backward order.

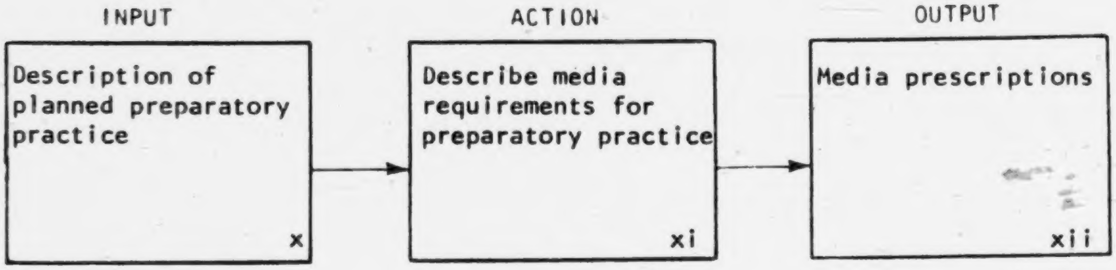


from

step	11.8
cell	
page	119

NO DETAILED ANALYSIS FOR

JB-STEP
11.8*

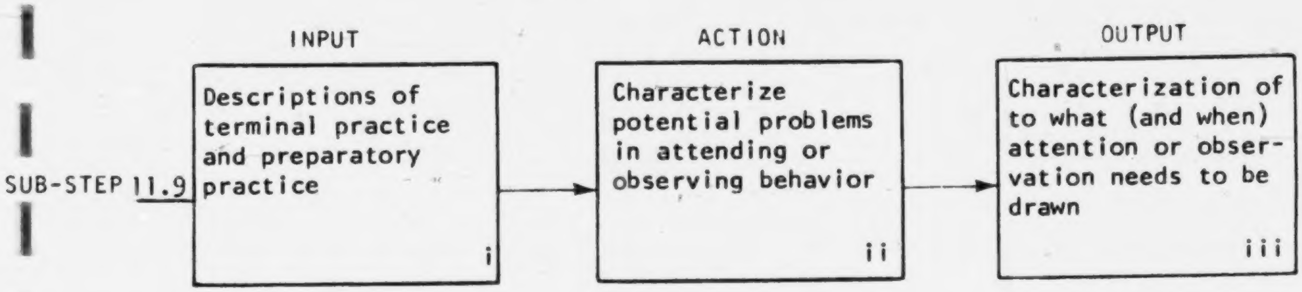

INPUT
ACTION
OUTPUT
Description of planned preparatory practice
x
Describe media requirements for preparatory practice
xi
Media prescriptions
xii

*Comparable to Sub-step 11.4, page 129.

from

step	11.9
cell	
page	119

DETAILED ANALYSIS FOR

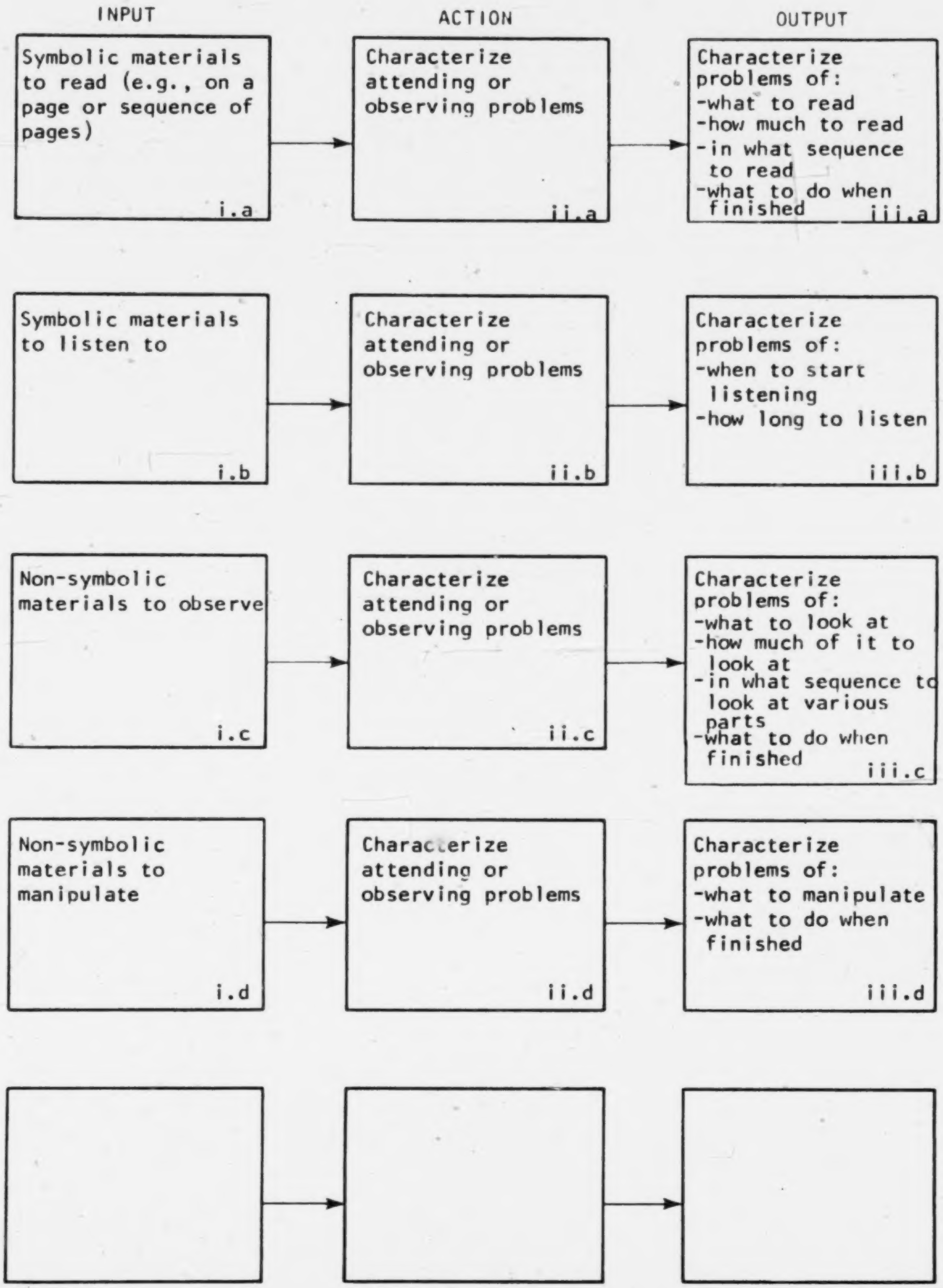

INPUT
ACTION
OUTPUT
SUB-STEP 11.9
Descriptions of terminal practice and preparatory practice
i
Characterize potential problems in attending or observing behavior
ii
Characterization of to what (and when) attention or observation needs to be drawn
iii

ON NEXT 1 PAGE

from

step	11.9
cell	i
page	119

MORE DETAILED DIAGRAM FOR DISCRIMINATIONS



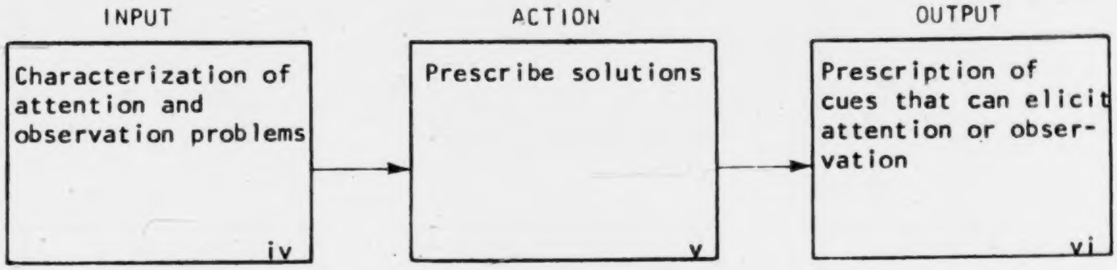
INPUT	ACTION	OUTPUT
Symbolic materials to read (e.g., on a page or sequence of pages) i.a	Characterize attending or observing problems ii.a	Characterize problems of: -what to read -how much to read -in what sequence to read -what to do when finished iii.a
Symbolic materials to listen to i.b	Characterize attending or observing problems ii.b	Characterize problems of: -when to start listening -how long to listen iii.b
Non-symbolic materials to observe i.c	Characterize attending or observing problems ii.c	Characterize problems of: -what to look at -how much of it to look at -in what sequence to look at various parts -what to do when finished iii.c
Non-symbolic materials to manipulate i.d	Characterize attending or observing problems ii.d	Characterize problems of: -what to manipulate -what to do when finished iii.d

from

step	11.10
cell	
page	119

DETAILED ANALYSIS FOR

SUB-STEP 11.10

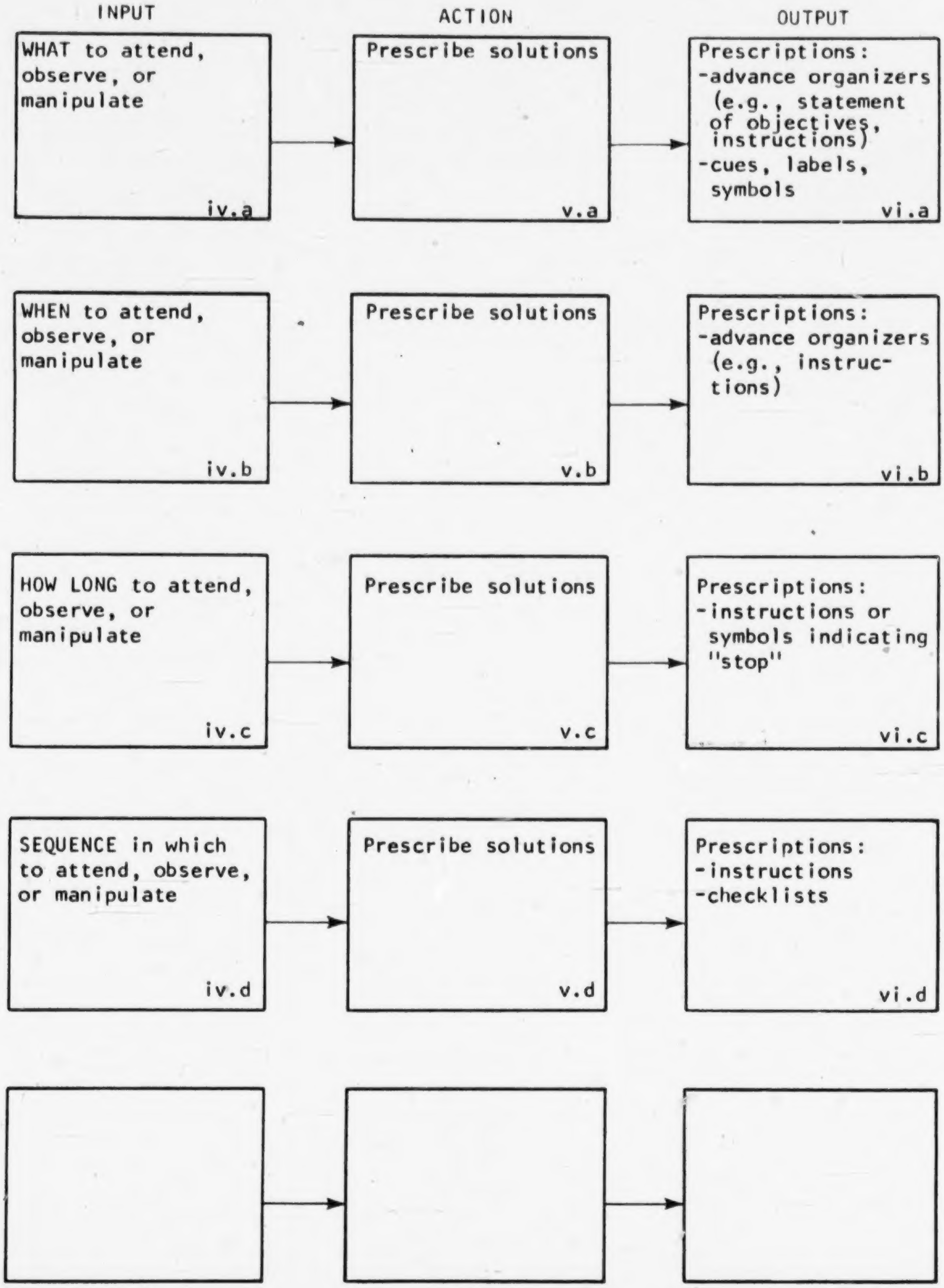

INPUT
Characterization of attention and observation problems
iv
ACTION
Prescribe solutions
v
OUTPUT
Prescription of cues that can elicit attention or observation
vi

ON NEXT 1 PAGE

from

step	11.10
cell	iv
page	119

MORE DETAILED DIAGRAM FOR DISCRIMINATIONS

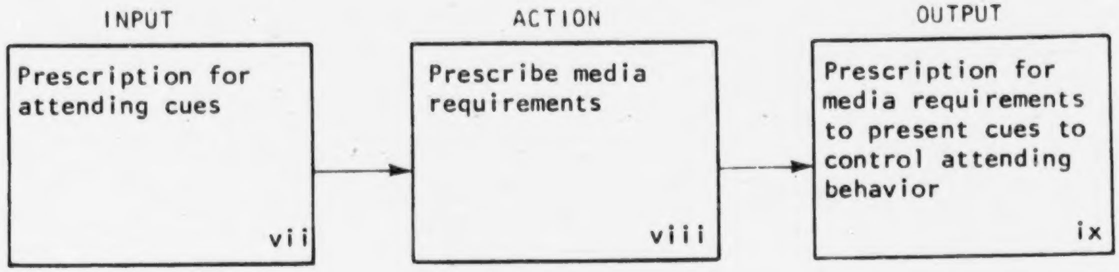


INPUT
ACTION
OUTPUT
WHAT to attend, observe, or manipulate
iv.a
Prescribe solutions
v.a
Prescriptions: -advance organizers (e.g., statement of objectives, instructions) -cues, labels, symbols
vi.a
WHEN to attend, observe, or manipulate
iv.b
Prescribe solutions
v.b
Prescriptions: -advance organizers (e.g., instructions)
vi.b
HOW LONG to attend, observe, or manipulate
iv.c
Prescribe solutions
v.c
Prescriptions: -instructions or symbols indicating "stop"
vi.c
SEQUENCE in which to attend, observe, or manipulate
iv.d
Prescribe solutions
v.d
Prescriptions: -instructions -checklists
vi.d

from	
step	11.11
cell	
page	120

NO DETAILED ANALYSIS FOR

SUB-STEP 11.11*

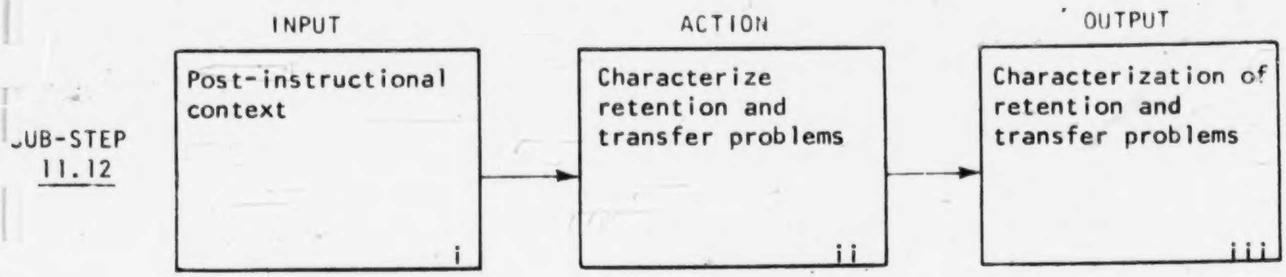

INPUT
ACTION
OUTPUT
Prescription for attending cues
vii
Prescribe media requirements
viii
Prescription for media requirements to present cues to control attending behavior
ix

*Comparable to Sub-step 11.4, page 129.

from

step	11.12
cell	
page	120

DETAILED ANALYSIS FOR


INPUT
ACTION
OUTPUT
SUB-STEP 11.12
Post-instructional context
i
Characterize retention and transfer problems
ii
Characterization of retention and transfer problems
iii

ON NEXT 3 PAGES

from

step	11.12
cell	
page	120

MORE DETAILED DIAGRAM FOR DISCRIMINATIONS (1a and 1b)

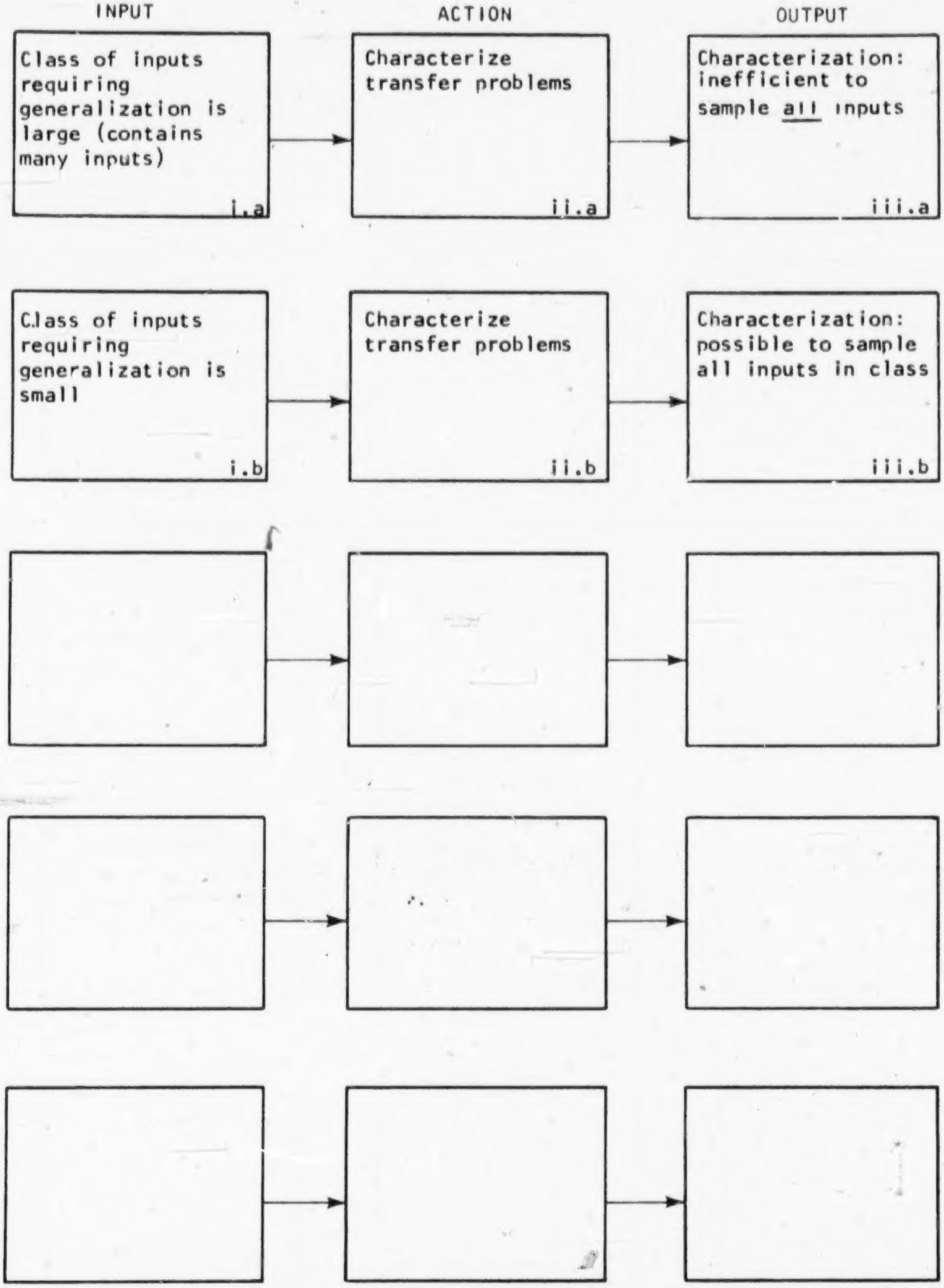
INPUT	ACTION	OUTPUT
Performance aid available after training i.a	Characterize retention problems ii.a	Characterization: less practice required during training; should be practice with performance aid iii.a
Performance aid not available after training i.b	Characterize retention problems ii.b	Characterization: more practice required during training; also, spaced-out review iii.b

Requirement: short term retention i.a	Characterize retention problems ii.a	Characterization: retention less of a problem (less practice needed) iii.a
Requirement: long term retention i.b	Characterize retention problems ii.b	Characterization: retention more of a problem (more practice needed) iii.b

from

step	11.12
cell	
page	120

MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS (2)

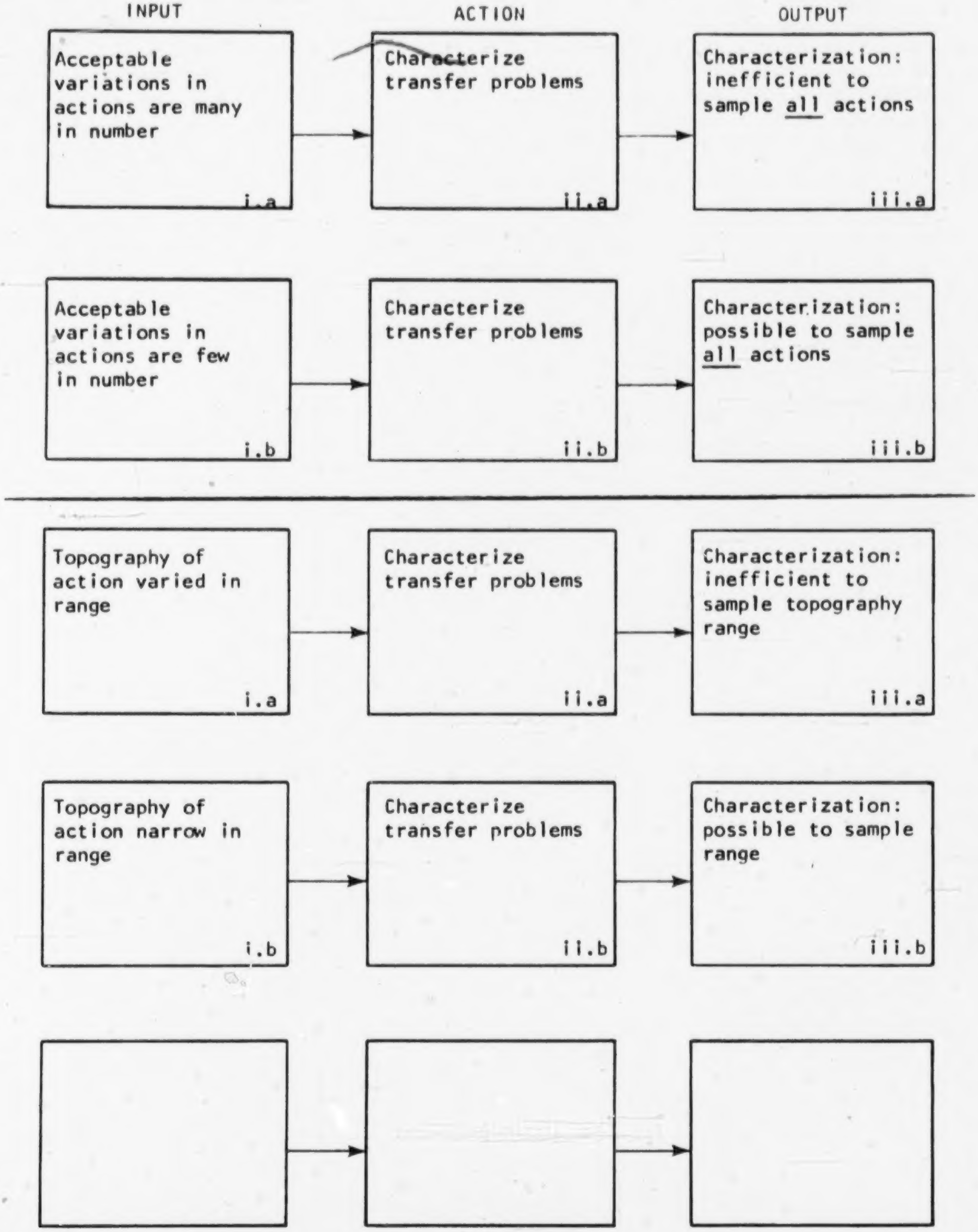


INPUT	ACTION	OUTPUT
Class of inputs requiring generalization is large (contains many inputs) i.a	Characterize transfer problems ii.a	Characterization: inefficient to sample all inputs iii.a
Class of inputs requiring generalization is small i.b	Characterize transfer problems ii.b	Characterization: possible to sample all inputs in class iii.b

from

step	11.12
cell	
page	120

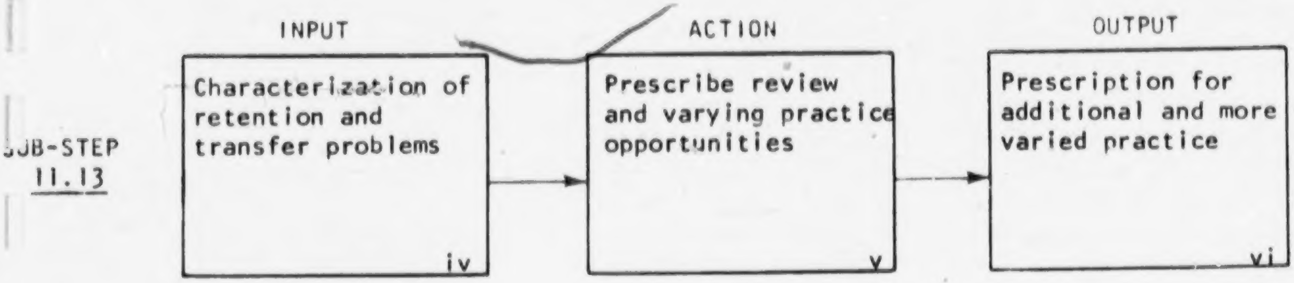
MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS (3a and 3b)


INPUT
ACTION
OUTPUT
Acceptable variations in actions are many in number
i.a
Characterize transfer problems
ii.a
Characterization: inefficient to sample all actions
iii.a
Acceptable variations in actions are few in number
i.b
Characterize transfer problems
ii.b
Characterization: possible to sample all actions
iii.b
Topography of action varied in range
i.a
Characterize transfer problems
ii.a
Characterization: inefficient to sample topography range
iii.a
Topography of action narrow in range
i.b
Characterize transfer problems
ii.b
Characterization: possible to sample range
iii.b

from

step	11.13
cell	
page	120

DETAILED ANALYSIS FOR

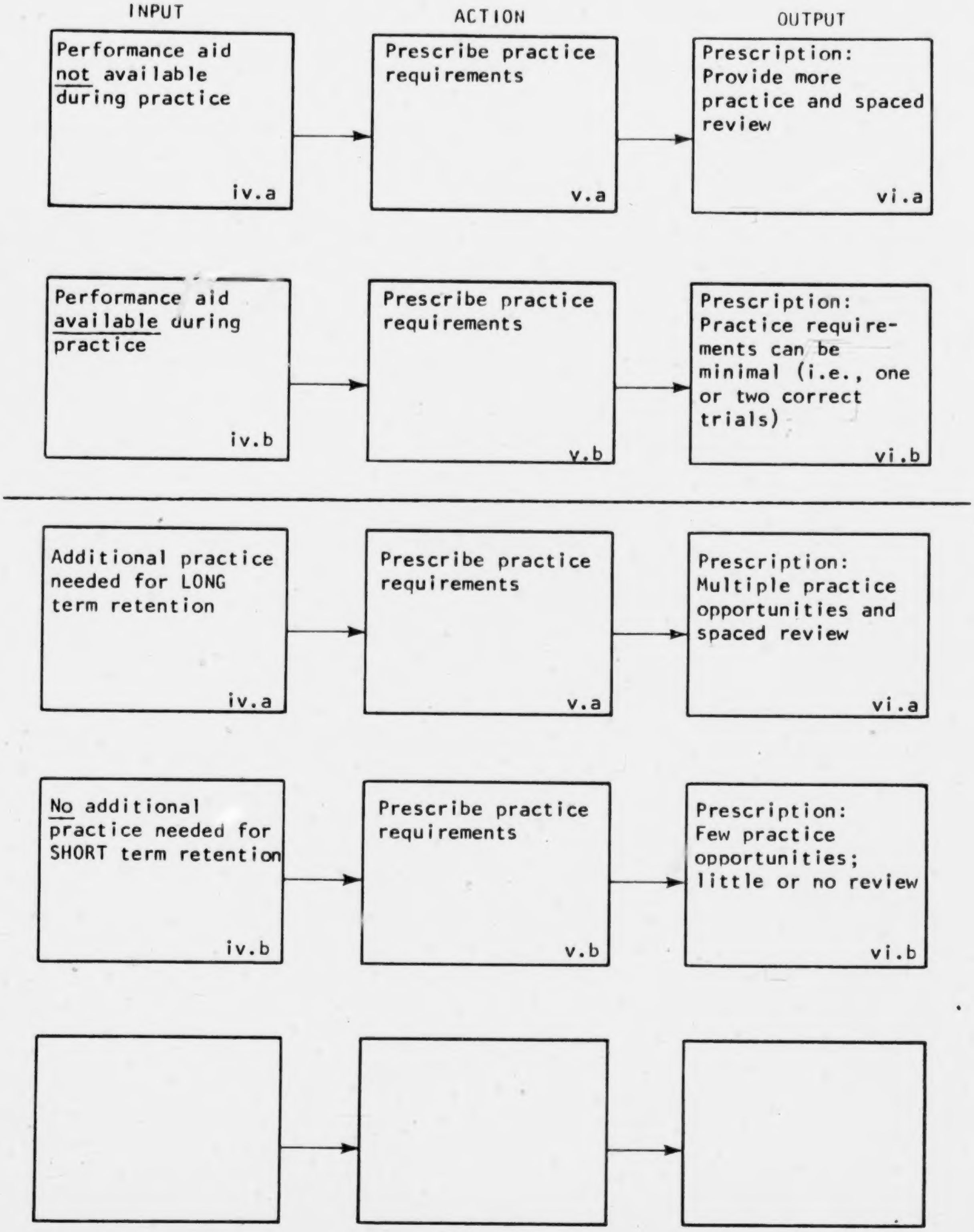

INPUT
ACTION
OUTPUT
SUB-STEP
11.13
Characterization of retention and transfer problems
iv
Prescribe review and varying practice opportunities
v
Prescription for additional and more varied practice
vi

ON NEXT 2 PAGES

from

step	11.13
cell	iv
page	120

MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS (1)

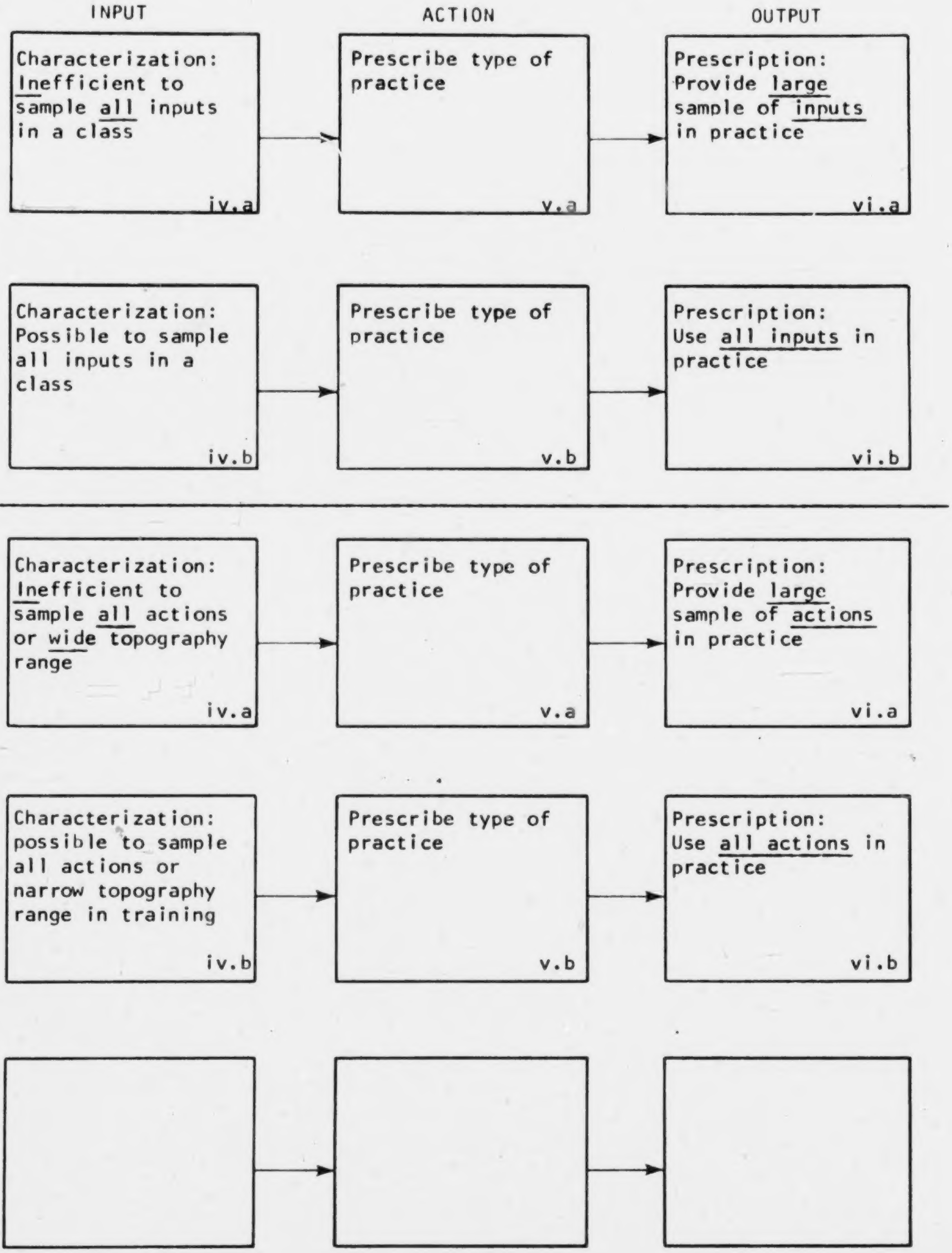


INPUT	ACTION	OUTPUT
Performance aid not available during practice iv.a	Prescribe practice requirements v.a	Prescription: Provide more practice and spaced review vi.a
Performance aid available during practice iv.b	Prescribe practice requirements v.b	Prescription: Practice requirements can be minimal (i.e., one or two correct trials) vi.b
Additional practice needed for LONG term retention iv.a	Prescribe practice requirements v.a	Prescription: Multiple practice opportunities and spaced review vi.a
No additional practice needed for SHORT term retention iv.b	Prescribe practice requirements v.b	Prescription: Few practice opportunities; little or no review vi.b

from

step	11.13
cell	iv
page	120

MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS (2)



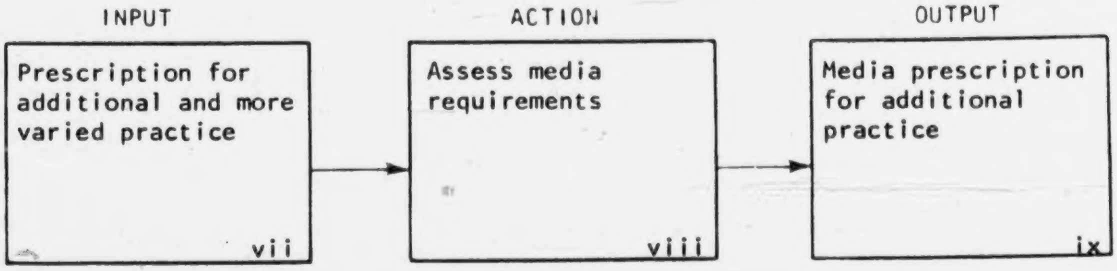
INPUT	ACTION	OUTPUT
Characterization: Inefficient to sample all inputs in a class iv.a	Prescribe type of practice v.a	Prescription: Provide large sample of inputs in practice vi.a
Characterization: Possible to sample all inputs in a class iv.b	Prescribe type of practice v.b	Prescription: Use all inputs in practice vi.b
Characterization: Inefficient to sample all actions or wide topography range iv.a	Prescribe type of practice v.a	Prescription: Provide large sample of actions in practice vi.a
Characterization: possible to sample all actions or narrow topography range in training iv.b	Prescribe type of practice v.b	Prescription: Use all actions in practice vi.b

from

step	11.14
cell	
page	120

NO DETAILED ANALYSIS FOR

UB-STEP
11.14*

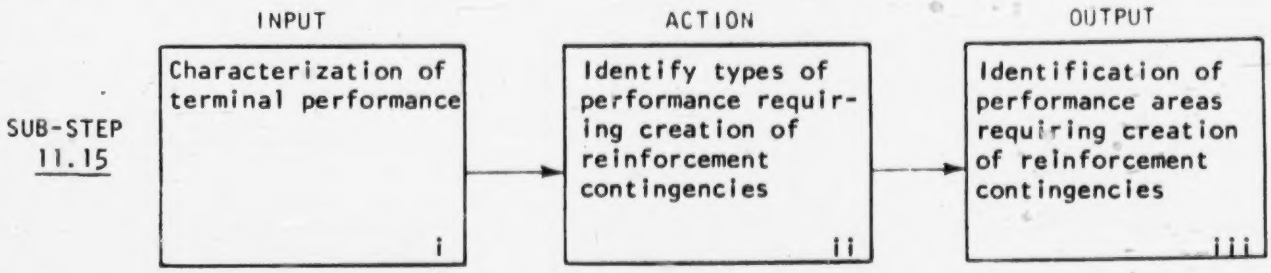

INPUT
ACTION
OUTPUT
Prescription for additional and more varied practice
vii
Assess media requirements
viii
Media prescription for additional practice
ix

*Comparable to Sub-step 11.4, page 129.

from

step	11.15
cell	
page	120

DETAILED ANALYSIS FOR

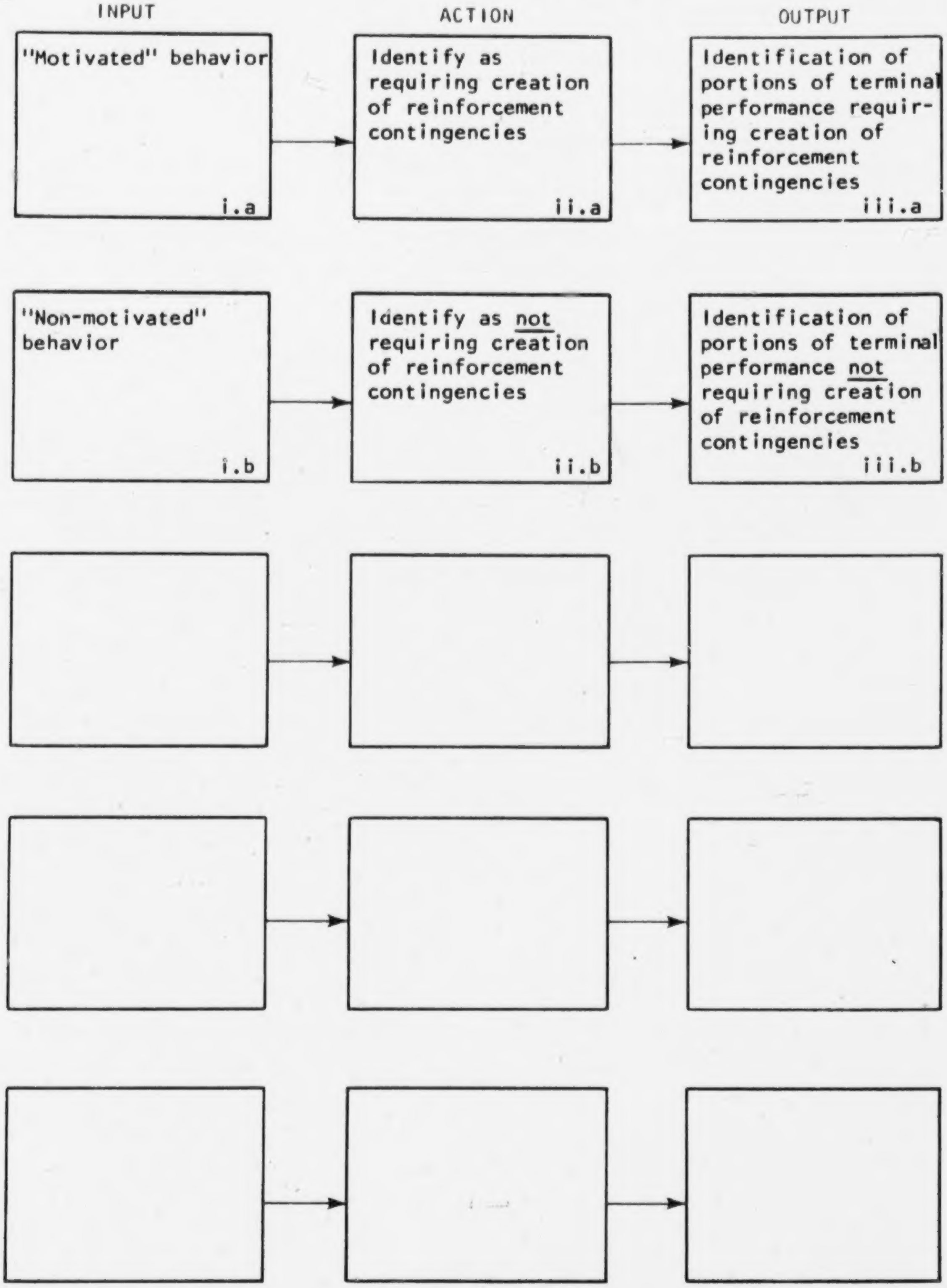

INPUT
ACTION
OUTPUT
SUB-STEP 11.15
Characterization of terminal performance
i
Identify types of performance requiring creation of reinforcement contingencies
ii
Identification of performance areas requiring creation of reinforcement contingencies
iii

ON NEXT 3 PAGES

from

step	11.15
cell	i
page	120

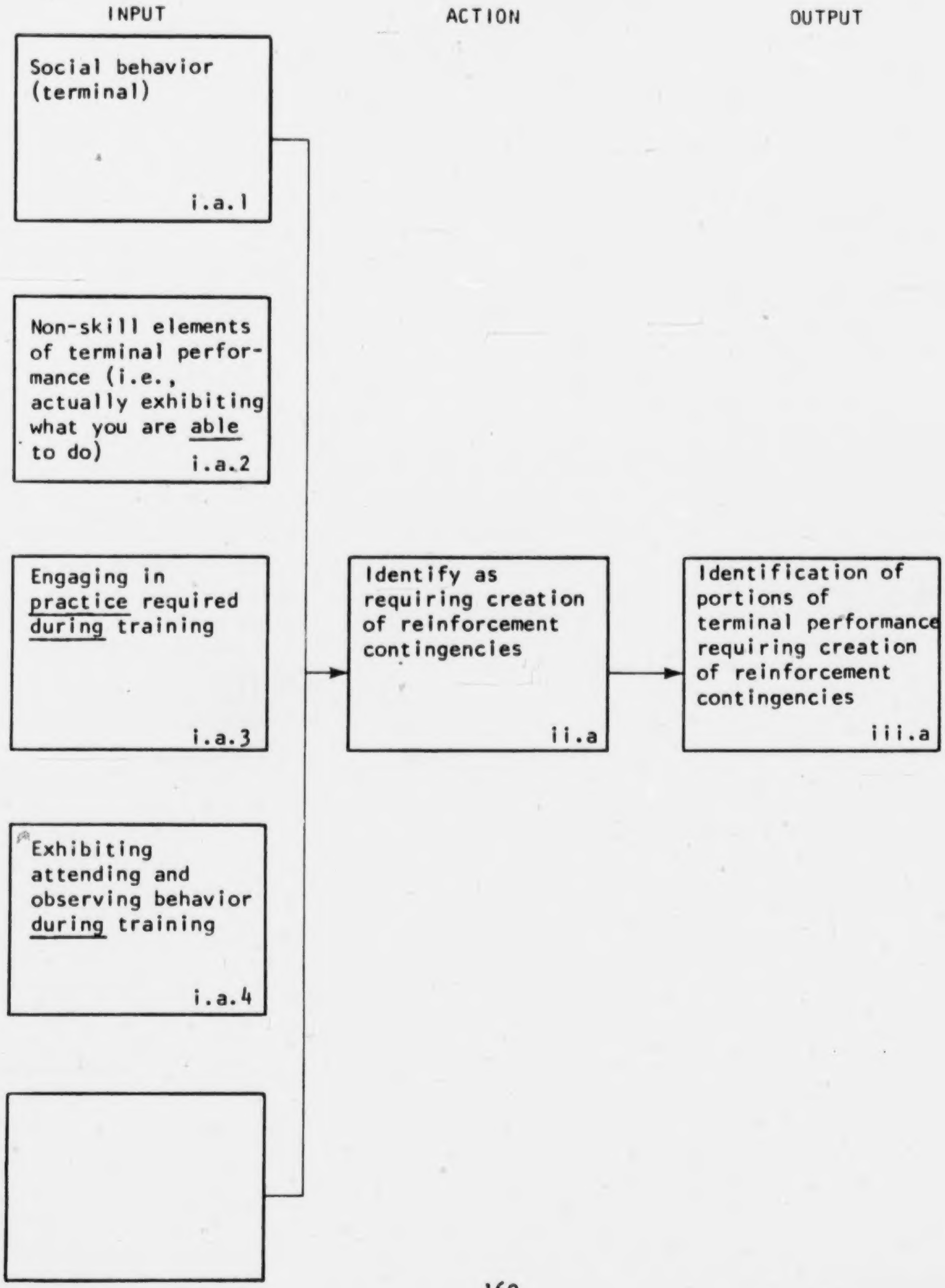
MORE DETAILED DIAGRAM FOR DISCRIMINATIONS


INPUT
ACTION
OUTPUT
"Motivated" behavior
i.a
Identify as requiring creation of reinforcement contingencies
ii.a
Identification of portions of terminal performance requiring creation of reinforcement contingencies
iii.a
"Non-motivated" behavior
i.b
Identify as not requiring creation of reinforcement contingencies
ii.b
Identification of portions of terminal performance not requiring creation of reinforcement contingencies
iii.b

from

step	11.15
cell	i.a
page	168

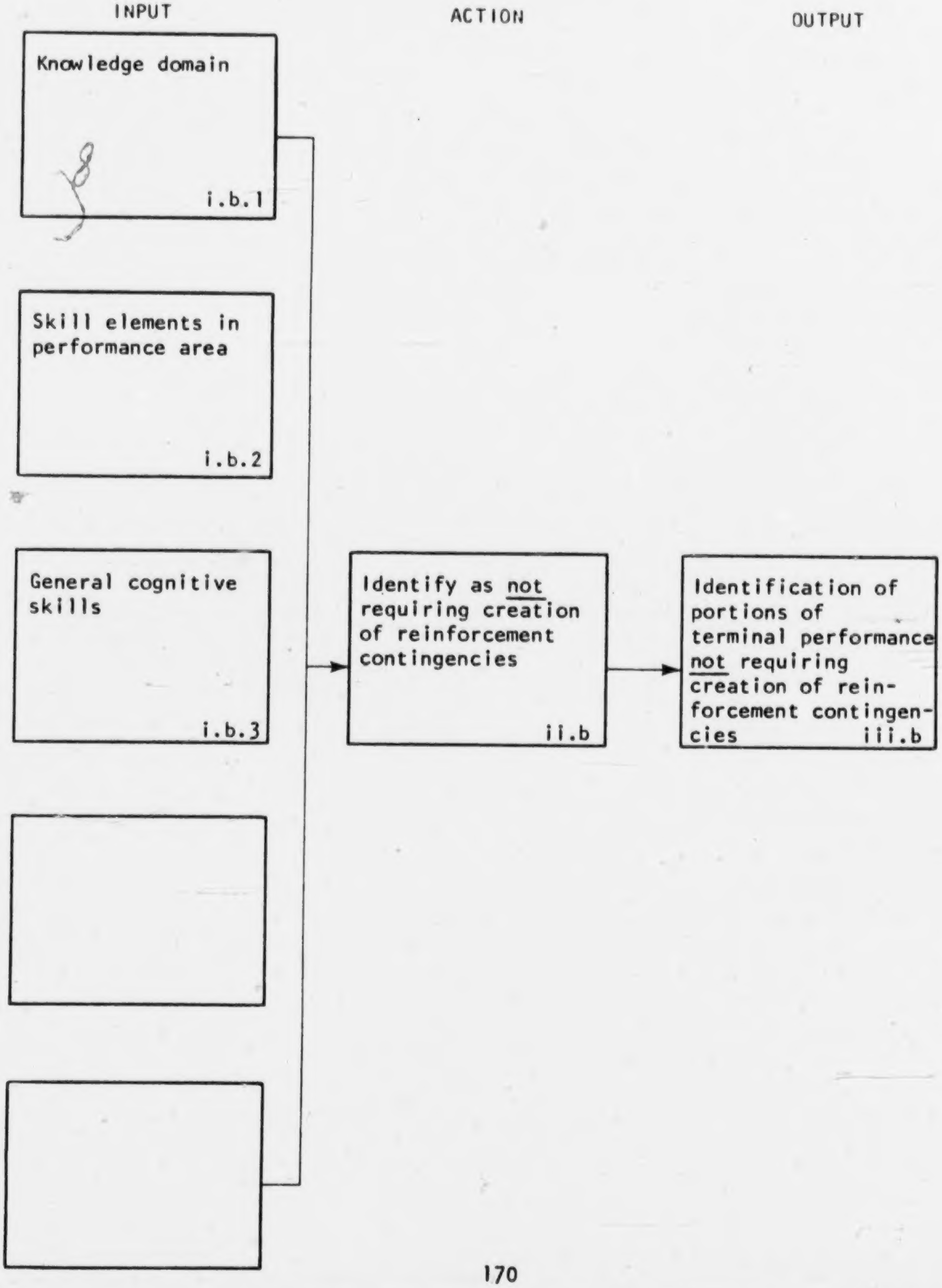
MORE DETAILED DIAGRAM FOR GENERALIZATIONS


INPUT
ACTION
OUTPUT
Social behavior (terminal)
i.a.1
Non-skill elements of terminal performance (i.e., actually exhibiting what you are able to do)
i.a.2
Engaging in practice required during training
i.a.3
Exhibiting attending and observing behavior during training
i.a.4
Identify as requiring creation of reinforcement contingencies
ii.a
Identification of portions of terminal performance requiring creation of reinforcement contingencies
iii.a

from

step	11.15
cell	i.b
page	168

MORE DETAILED DIAGRAM FOR GENERALIZATIONS

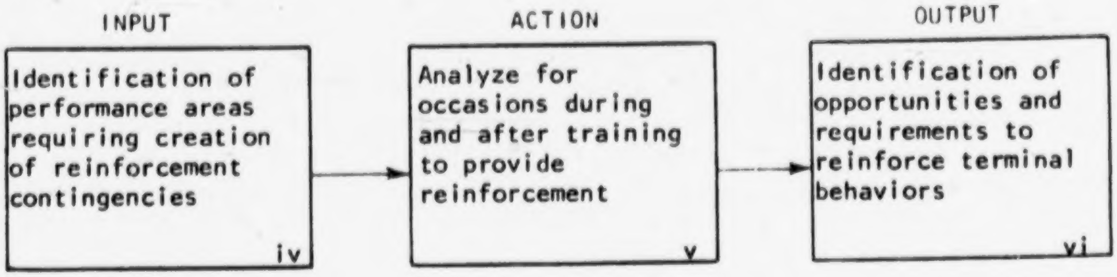

INPUT
ACTION
OUTPUT
Knowledge domain
i.b.1
Skill elements in performance area
i.b.2
General cognitive skills
i.b.3
Identify as not requiring creation of reinforcement contingencies
ii.b
Identification of portions of terminal performance not requiring creation of reinforcement contingencies
iii.b

from

step	11.16
cell	
page	

NO DETAILED ANALYSIS FOR

SUB-STEP
11.16

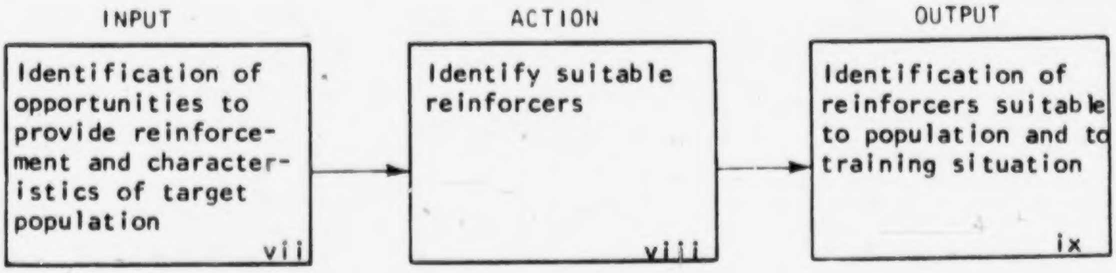

INPUT
Identification of performance areas requiring creation of reinforcement contingencies
iv
ACTION
Analyze for occasions during and after training to provide reinforcement
v
OUTPUT
Identification of opportunities and requirements to reinforce terminal behaviors
vi

from

step	11.17
cell	
page	121

DETAILED ANALYSIS FOR

SUB-STEP
11.17

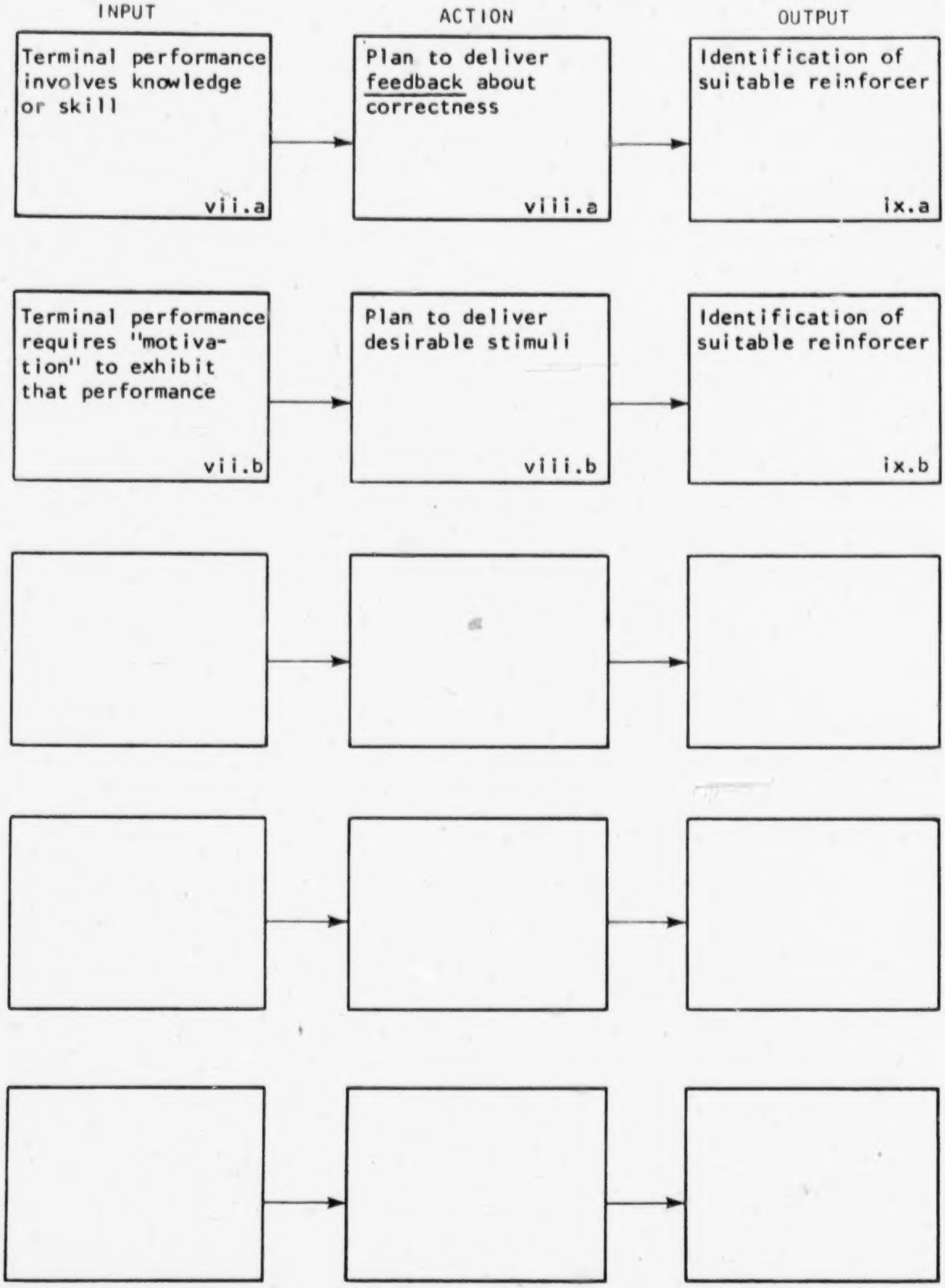

INPUT
ACTION
OUTPUT
Identification of opportunities to provide reinforcement and characteristics of target population
vii
Identify suitable reinforcers
viii
Identification of reinforcers suitable to population and to training situation
ix

ON NEXT 2 PAGES

from

step	11.17
cell	vii
page	121

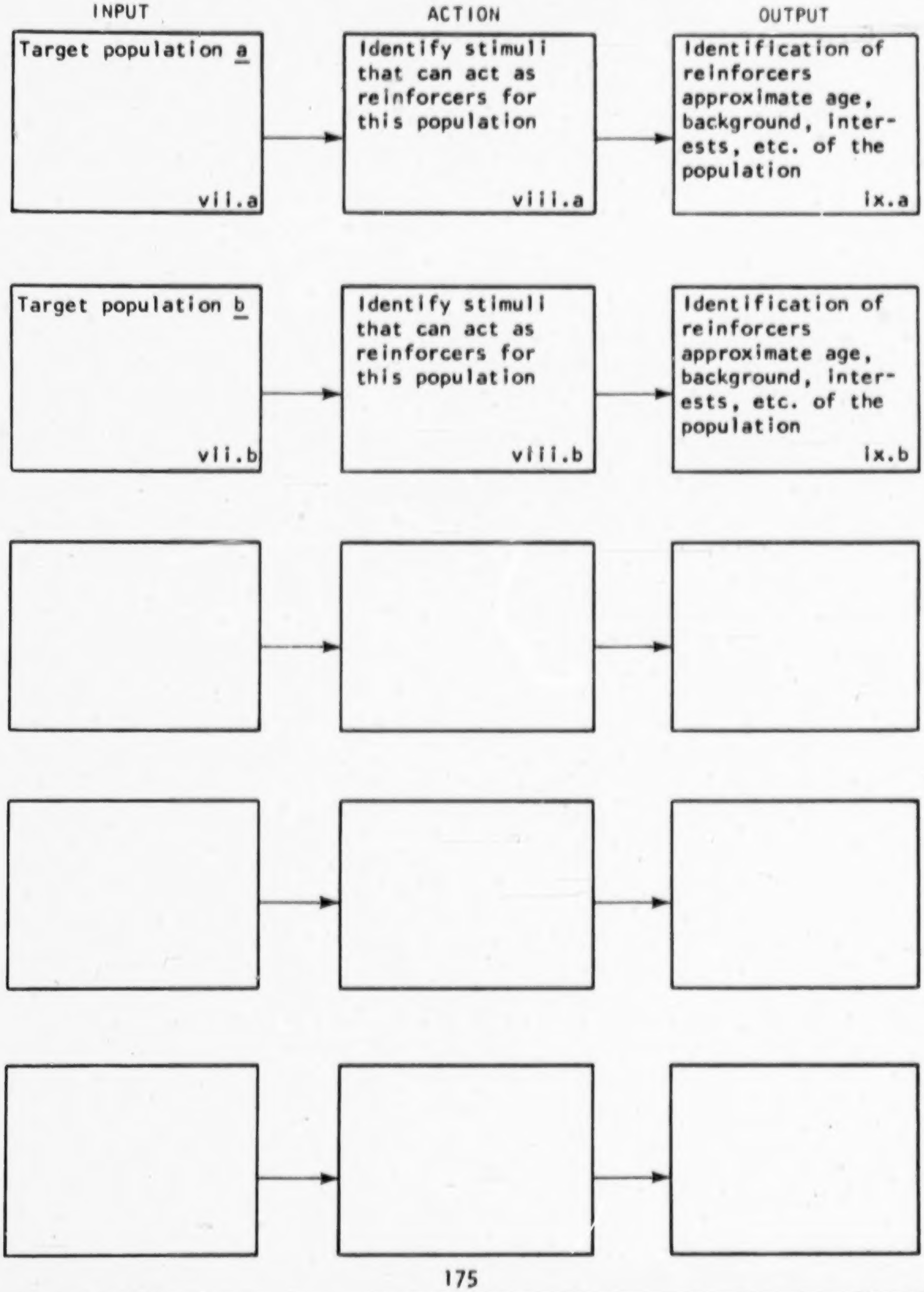
MORE DETAILED DIAGRAM FOR DISCRIMINATIONS (1)


INPUT
ACTION
OUTPUT
Terminal performance involves knowledge or skill
vii.a
Plan to deliver feedback about correctness
viii.a
Identification of suitable reinforcer
ix.a
Terminal performance requires "motivation" to exhibit that performance
vii.b
Plan to deliver desirable stimuli
viii.b
Identification of suitable reinforcer
ix.b

from

step	11.17
cell	vii
page	121

MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS (2)



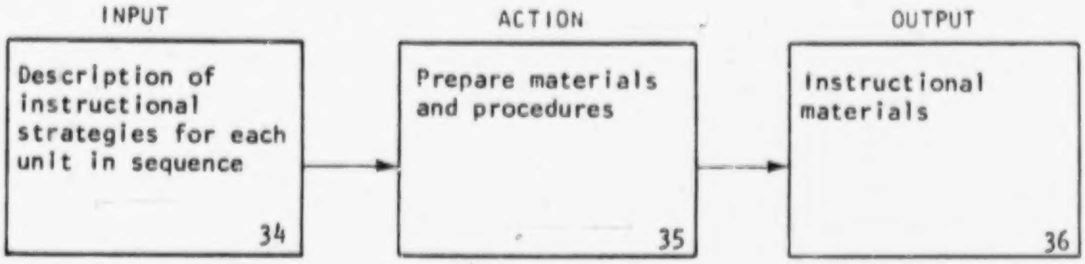
INPUT	ACTION	OUTPUT
Target population a vii.a	Identify stimuli that can act as reinforcers for this population viii.a	Identification of reinforcers approximate age, background, interests, etc. of the population ix.a
Target population b vii.b	Identify stimuli that can act as reinforcers for this population viii.b	Identification of reinforcers approximate age, background, interests, etc. of the population ix.b

from

step	12
cell	
page	3

DETAILED ANALYSIS FOR

STEP 12


INPUT
ACTION
OUTPUT
Description of instructional strategies for each unit in sequence
34
Prepare materials and procedures
35
Instructional materials
36

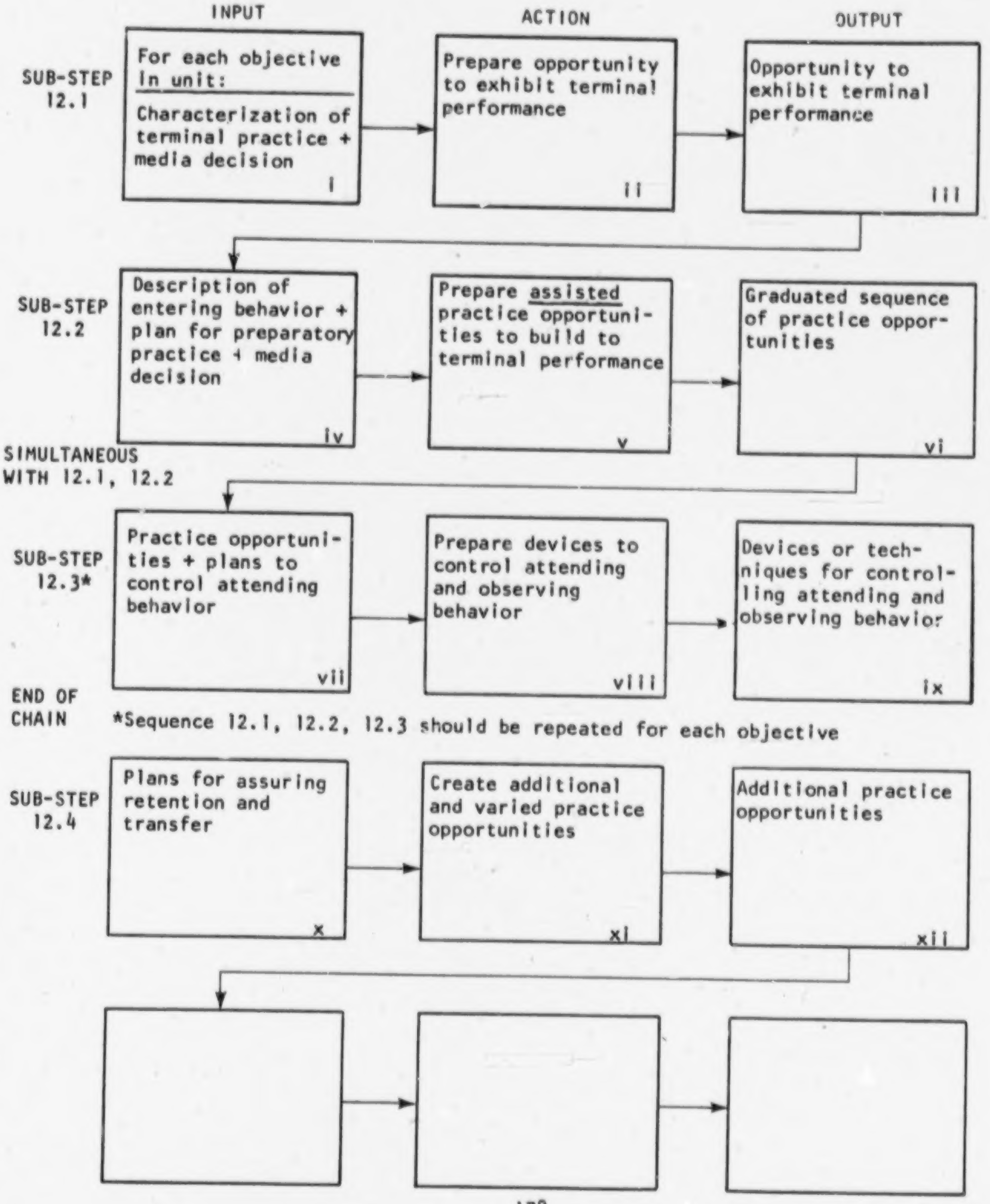
ON NEXT 9 PAGES

FOLD OUT THIS PAGE.

from

step	12
cell	
page	3

MORE DETAILED DIAGRAM FOR CHAINS

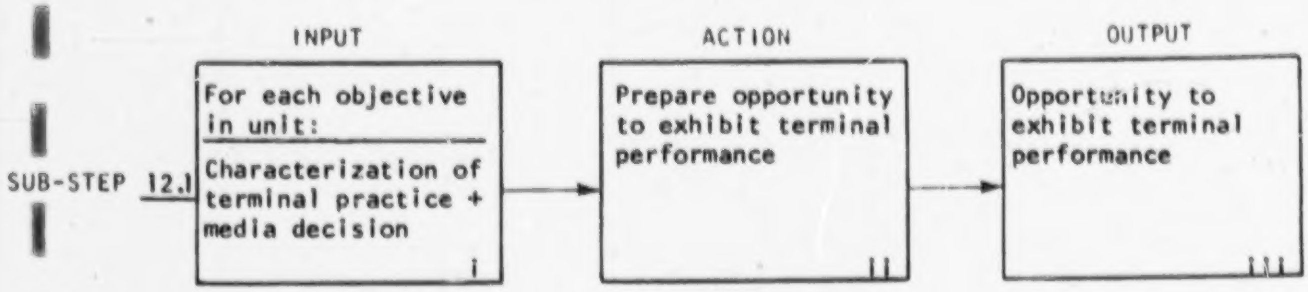

INPUT
ACTION
OUTPUT
SUB-STEP 12.1
For each objective in unit:
Characterization of terminal practice + media decision
i
Prepare opportunity to exhibit terminal performance
ii
Opportunity to exhibit terminal performance
iii
SUB-STEP 12.2
Description of entering behavior + plan for preparatory practice + media decision
iv
Prepare assisted practice opportunities to build to terminal performance
v
Graduated sequence of practice opportunities
vi
SIMULTANEOUS WITH 12.1, 12.2
SUB-STEP 12.3*
Practice opportunities + plans to control attending behavior
vii
Prepare devices to control attending and observing behavior
viii
Devices or techniques for controlling attending and observing behavior
ix
END OF CHAIN
SUB-STEP 12.4
Plans for assuring retention and transfer
x
Create additional and varied practice opportunities
xi
Additional practice opportunities
xii

*Sequence 12.1, 12.2, 12.3 should be repeated for each objective

from

step	12.1
cell	i
page	178

DETAILED ANALYSIS FOR

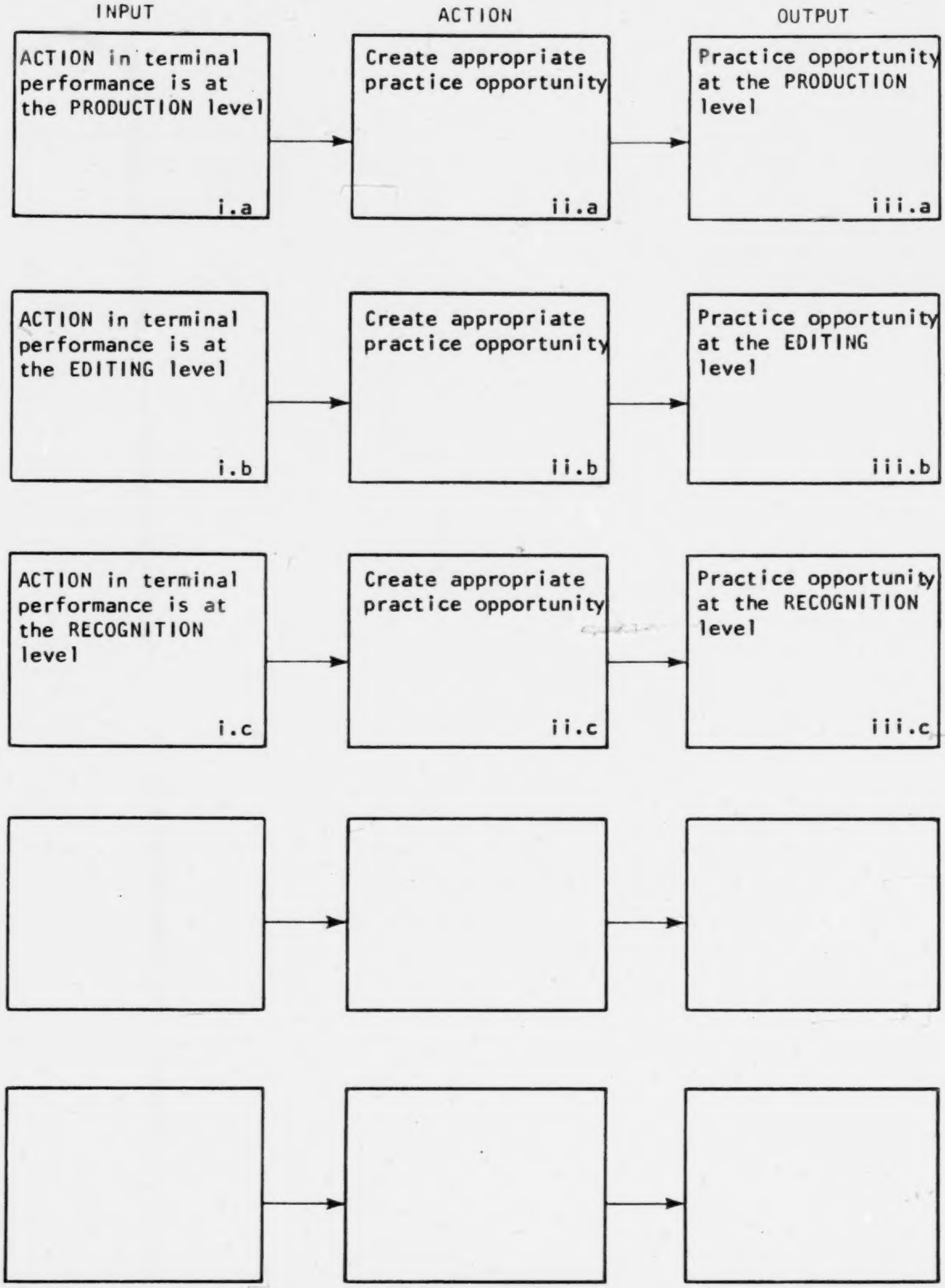

INPUT
ACTION
OUTPUT
SUB-STEP 12.1
For each objective in unit:
Characterization of terminal practice + media decision
i
Prepare opportunity to exhibit terminal performance
ii
Opportunity to exhibit terminal performance
iii

ON NEXT 3 PAGES

from

step	12.1
cell	i
page	178

MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS (1)

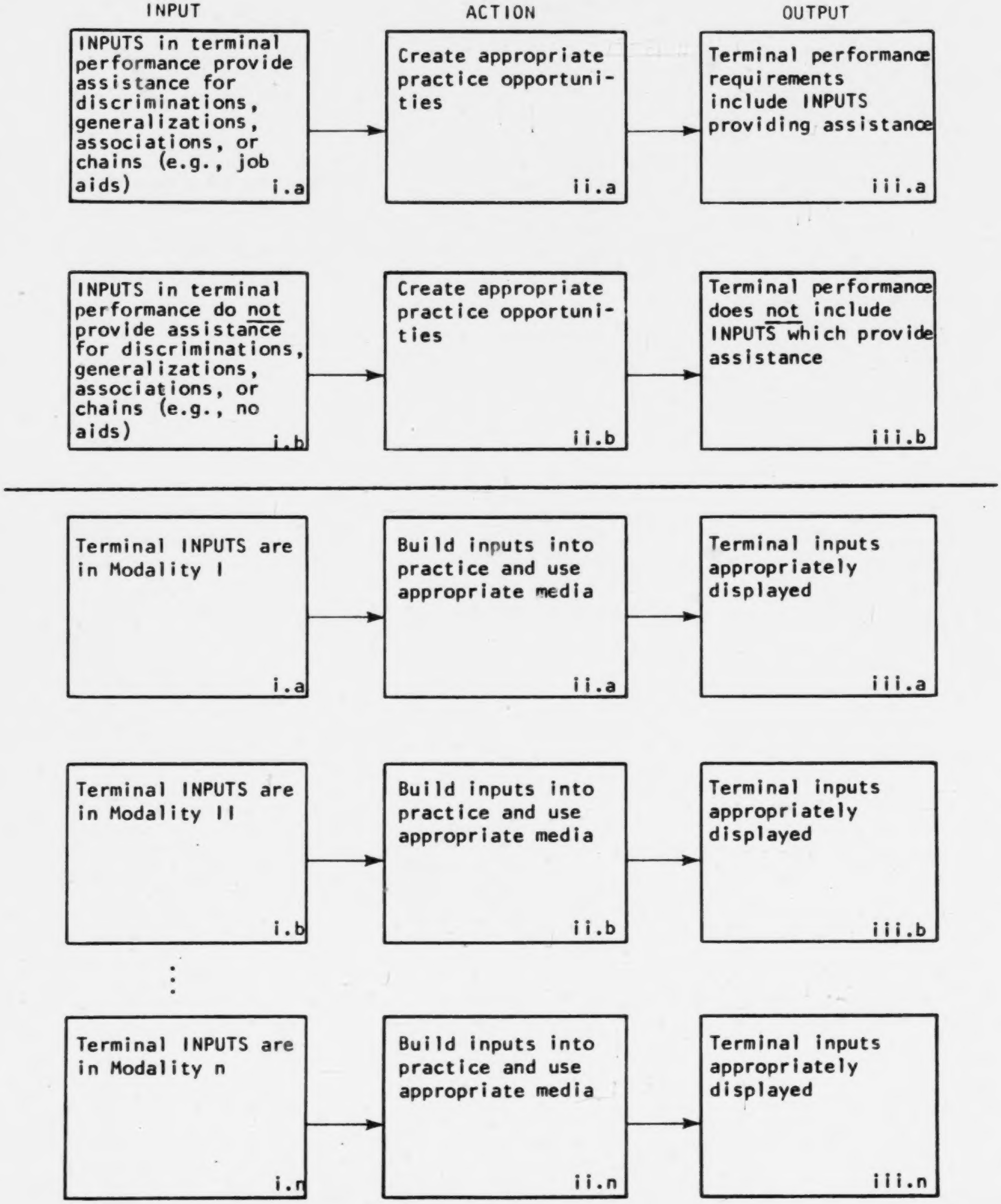


INPUT	ACTION	OUTPUT
ACTION in terminal performance is at the PRODUCTION level i.a	Create appropriate practice opportunity ii.a	Practice opportunity at the PRODUCTION level iii.a
ACTION in terminal performance is at the EDITING level i.b	Create appropriate practice opportunity ii.b	Practice opportunity at the EDITING level iii.b
ACTION in terminal performance is at the RECOGNITION level i.c	Create appropriate practice opportunity ii.c	Practice opportunity at the RECOGNITION level iii.c

from

step	12.1
cell	i
page	178

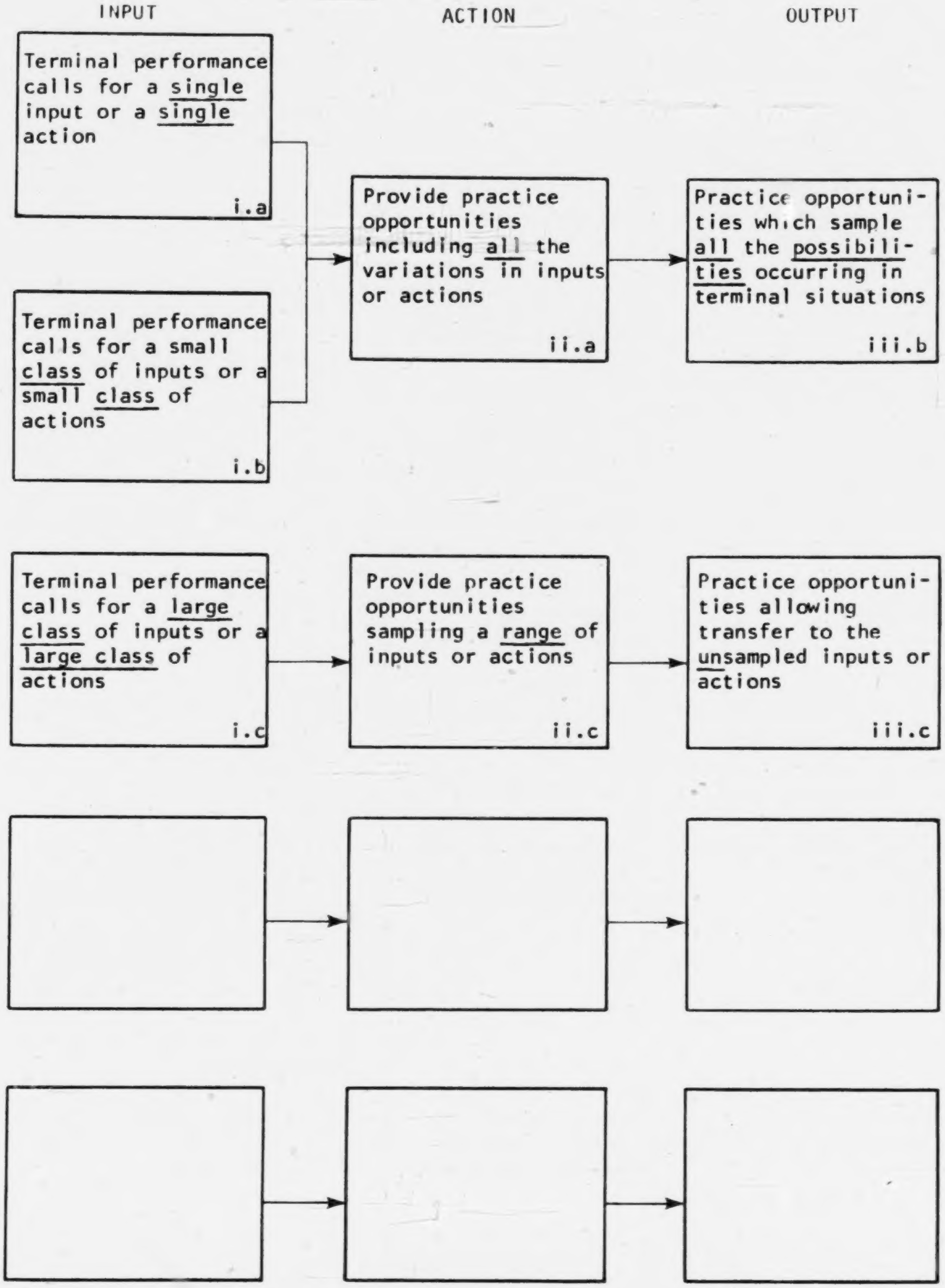
MORE DETAILED DIAGRAM FOR DISCRIMINATIONS (2)


INPUT
ACTION
OUTPUT
INPUTS in terminal performance provide assistance for discriminations, generalizations, associations, or chains (e.g., job aids) i.a
Create appropriate practice opportunities ii.a
Terminal performance requirements include INPUTS providing assistance iii.a
INPUTS in terminal performance do not provide assistance for discriminations, generalizations, associations, or chains (e.g., no aids) i.b
Create appropriate practice opportunities ii.b
Terminal performance does not include INPUTS which provide assistance iii.b
Terminal INPUTS are in Modality I i.a
Build inputs into practice and use appropriate media ii.a
Terminal inputs appropriately displayed iii.a
Terminal INPUTS are in Modality II i.b
Build inputs into practice and use appropriate media ii.b
Terminal inputs appropriately displayed iii.b
Terminal INPUTS are in Modality n i.n
Build inputs into practice and use appropriate media ii.n
Terminal inputs appropriately displayed iii.n

from

step	12.1
cell	i
page	178

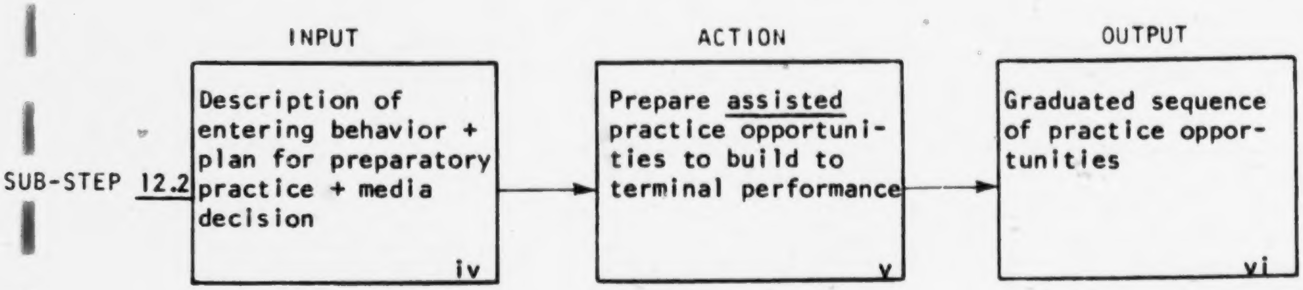
MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS (3)


INPUT
ACTION
OUTPUT
Terminal performance calls for a single input or a single action i.a
Terminal performance calls for a small class of inputs or a small class of actions i.b
Provide practice opportunities including all the variations in inputs or actions ii.a
Practice opportunities which sample all the possibilities occurring in terminal situations iii.b
Terminal performance calls for a large class of inputs or a large class of actions i.c
Provide practice opportunities sampling a range of inputs or actions ii.c
Practice opportunities allowing transfer to the unsampled inputs or actions iii.c

from

step	12.2
cell	
page	178

DETAILED ANALYSIS FOR

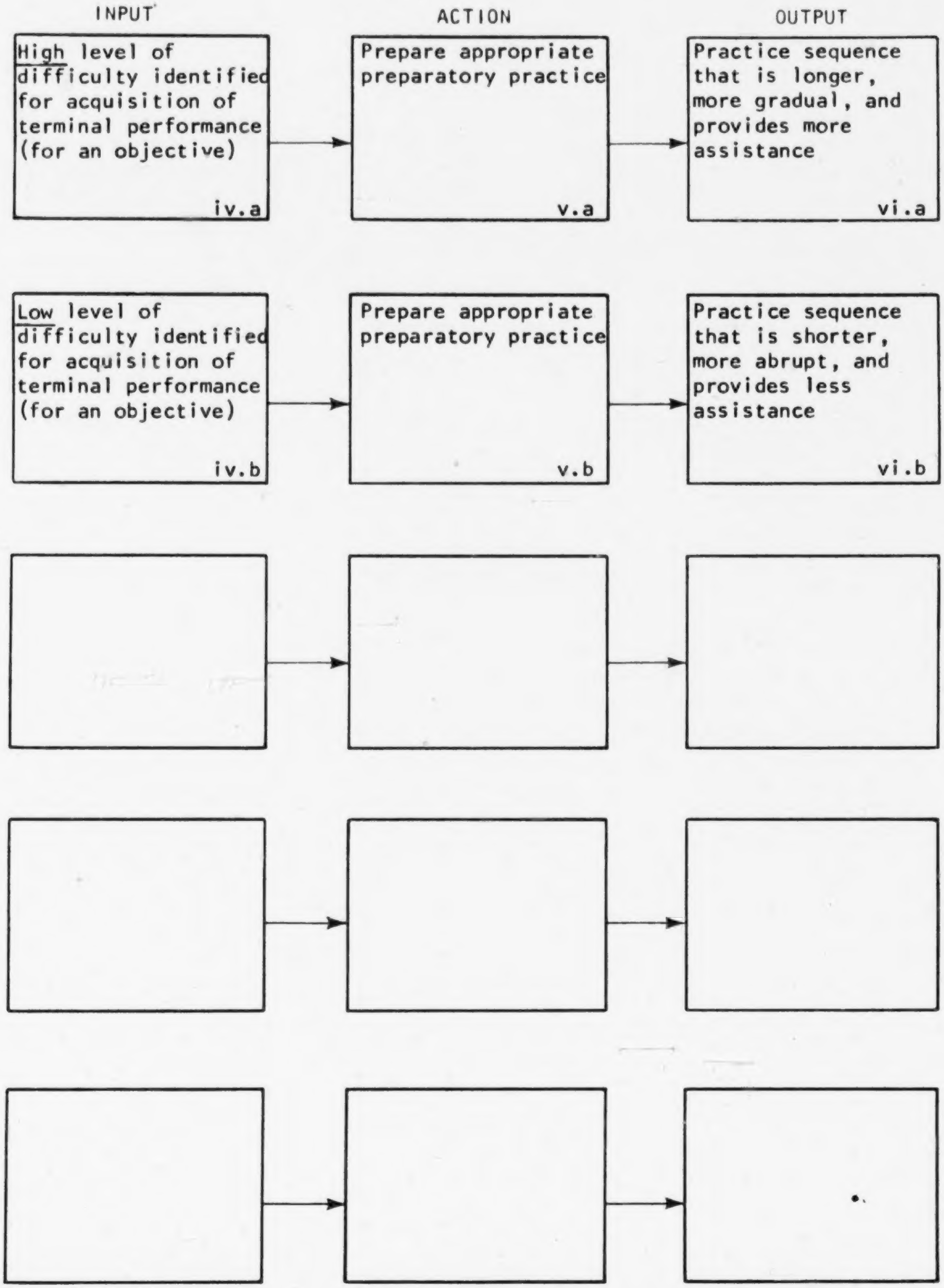

INPUT
ACTION
OUTPUT
SUB-STEP 12.2
Description of entering behavior + plan for preparatory practice + media decision
iv
Prepare assisted practice opportunities to build to terminal performance
v
Graduated sequence of practice opportunities
vi

ON NEXT 1 PAGE

from

step	12.2
cell	iv
page	178

MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS (1)

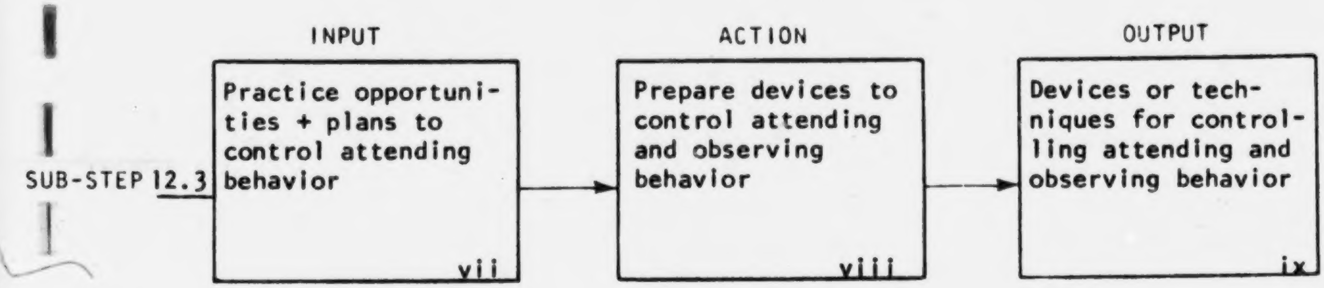


INPUT	ACTION	OUTPUT
High level of difficulty identified for acquisition of terminal performance (for an objective) iv.a	Prepare appropriate preparatory practice v.a	Practice sequence that is longer, more gradual, and provides more assistance vi.a
Low level of difficulty identified for acquisition of terminal performance (for an objective) iv.b	Prepare appropriate preparatory practice v.b	Practice sequence that is shorter, more abrupt, and provides less assistance vi.b

from

step	12.3
cell	
page	178

DETAILED ANALYSIS FOR

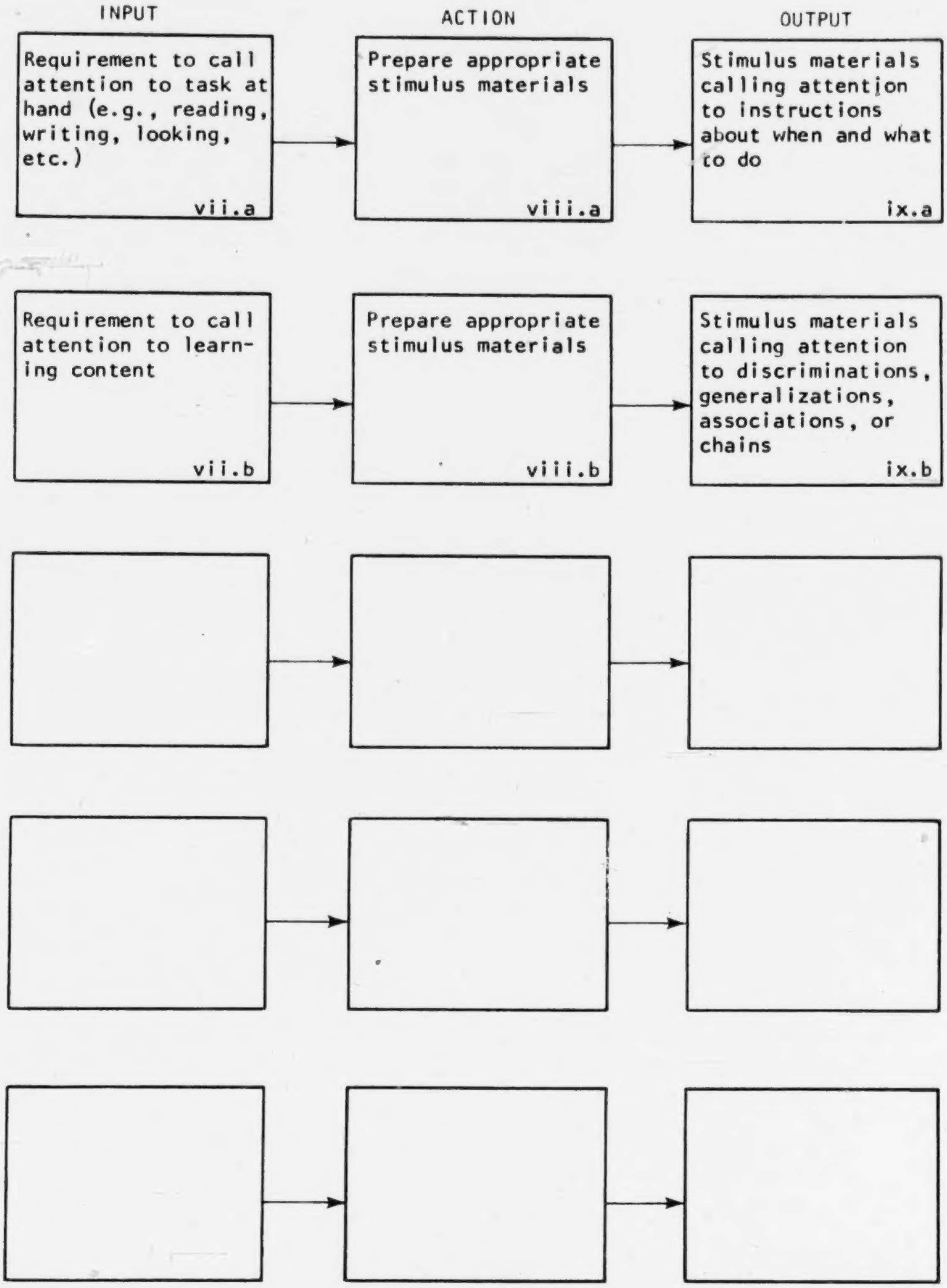

INPUT
ACTION
OUTPUT
SUB-STEP 12.3
Practice opportunities + plans to control attending behavior
vii
Prepare devices to control attending and observing behavior
viii
Devices or techniques for controlling attending and observing behavior
ix

ON NEXT 1 PAGE

from

step	12.3
cell	vii
page	178

MORE DETAILED DIAGRAM FOR DISCRIMINATIONS

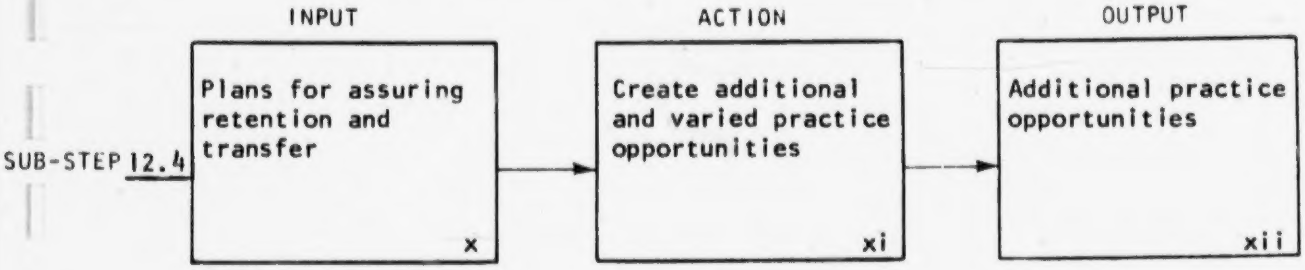


INPUT	ACTION	OUTPUT
Requirement to call attention to task at hand (e.g., reading, writing, looking, etc.) vii.a	Prepare appropriate stimulus materials viii.a	Stimulus materials calling attention to instructions about when and what to do ix.a
Requirement to call attention to learning content vii.b	Prepare appropriate stimulus materials viii.b	Stimulus materials calling attention to discriminations, generalizations, associations, or chains ix.b

from

step	12.4
cell	
page	178

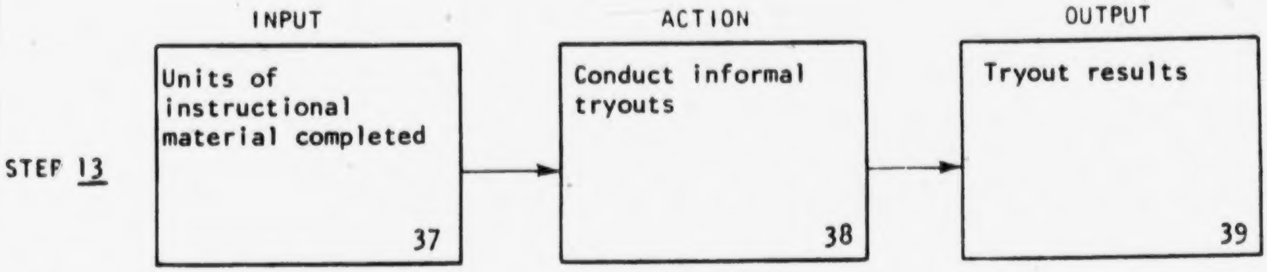
NO DETAILED ANALYSIS FOR


INPUT
ACTION
OUTPUT
SUB-STEP 12.4
Plans for assuring retention and transfer
x
Create additional and varied practice opportunities
xi
Additional practice opportunities
xii

from

step	13
cell	
page	3

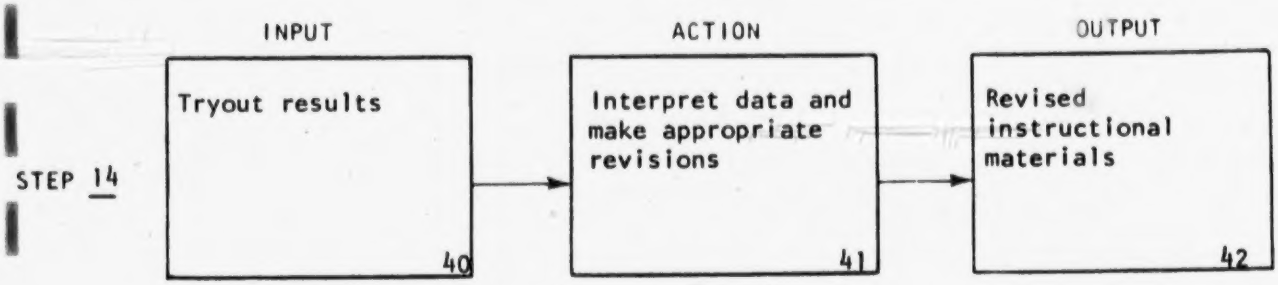
NO DETAILED ANALYSIS FOR


INPUT
ACTION
OUTPUT
STEP 13
Units of instructional material completed
37
Conduct informal tryouts
38
Tryout results
39

from

step	14
cell	
page	3

DETAILED ANALYSIS FOR

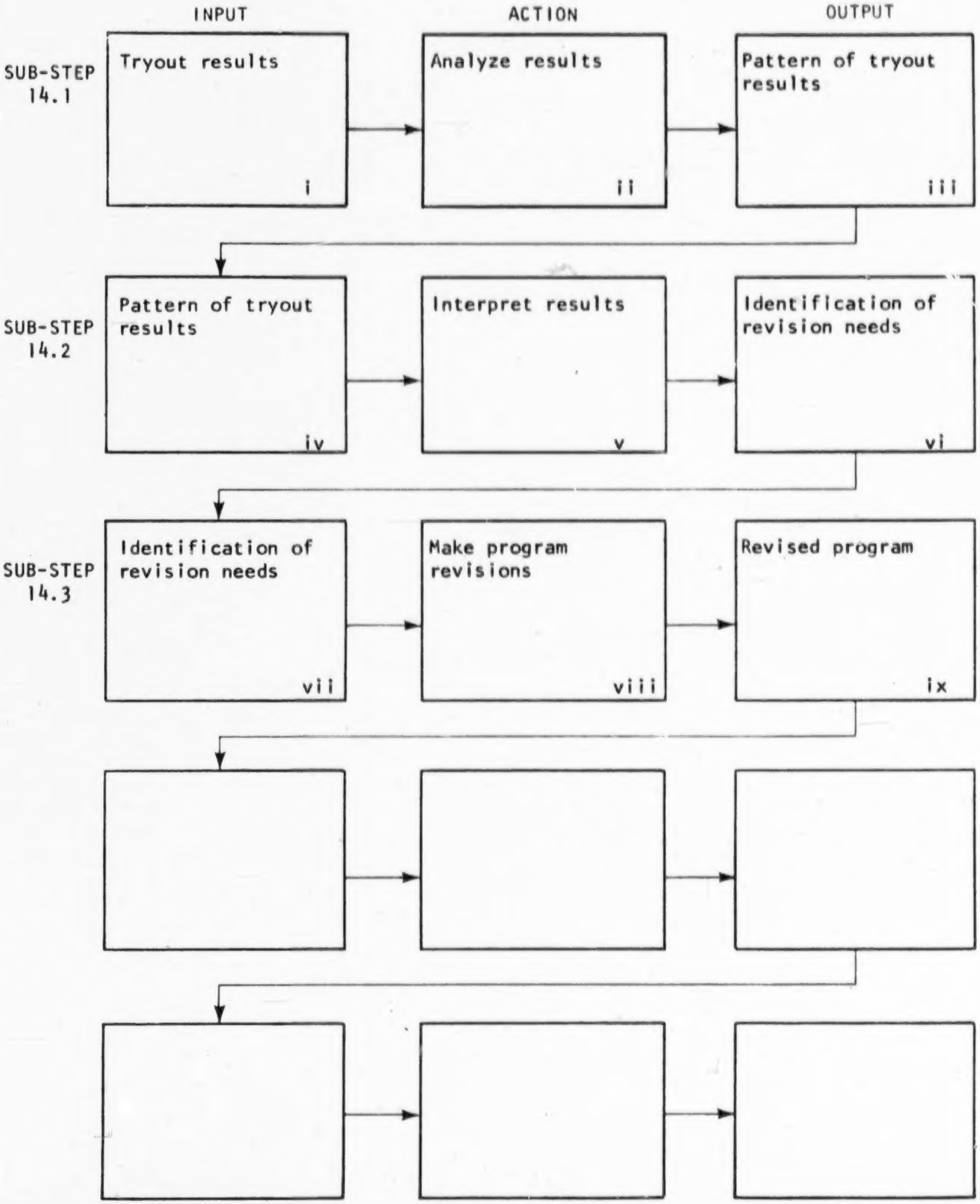

STEP 14
INPUT
Tryout results
40
ACTION
Interpret data and make appropriate revisions
41
OUTPUT
Revised instructional materials
42

ON NEXT 11 PAGES

from

step	14
cell	
page	3

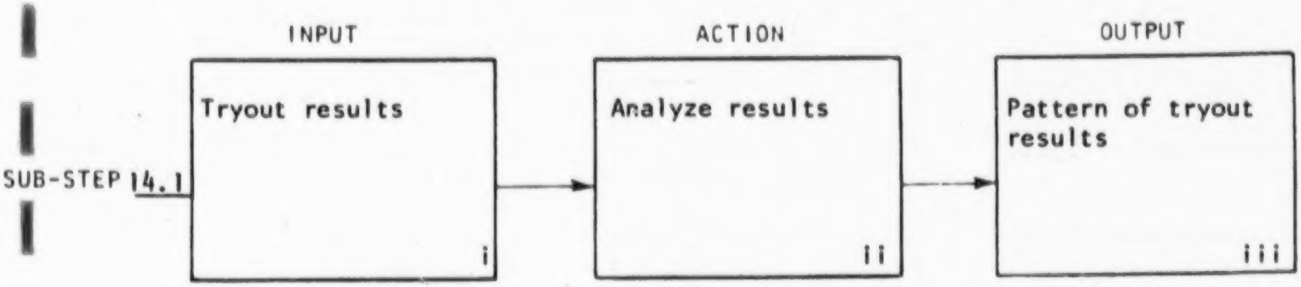
MORE DETAILED
DIAGRAM FOR CHAINS


INPUT
ACTION
OUTPUT
SUB-STEP 14.1
Tryout results
i
Analyze results
ii
Pattern of tryout results
iii
SUB-STEP 14.2
Pattern of tryout results
iv
Interpret results
v
Identification of revision needs
vi
SUB-STEP 14.3
Identification of revision needs
vii
Make program revisions
viii
Revised program
ix

from

step	14.1
cell	
page	192

DETAILED ANALYSIS FOR

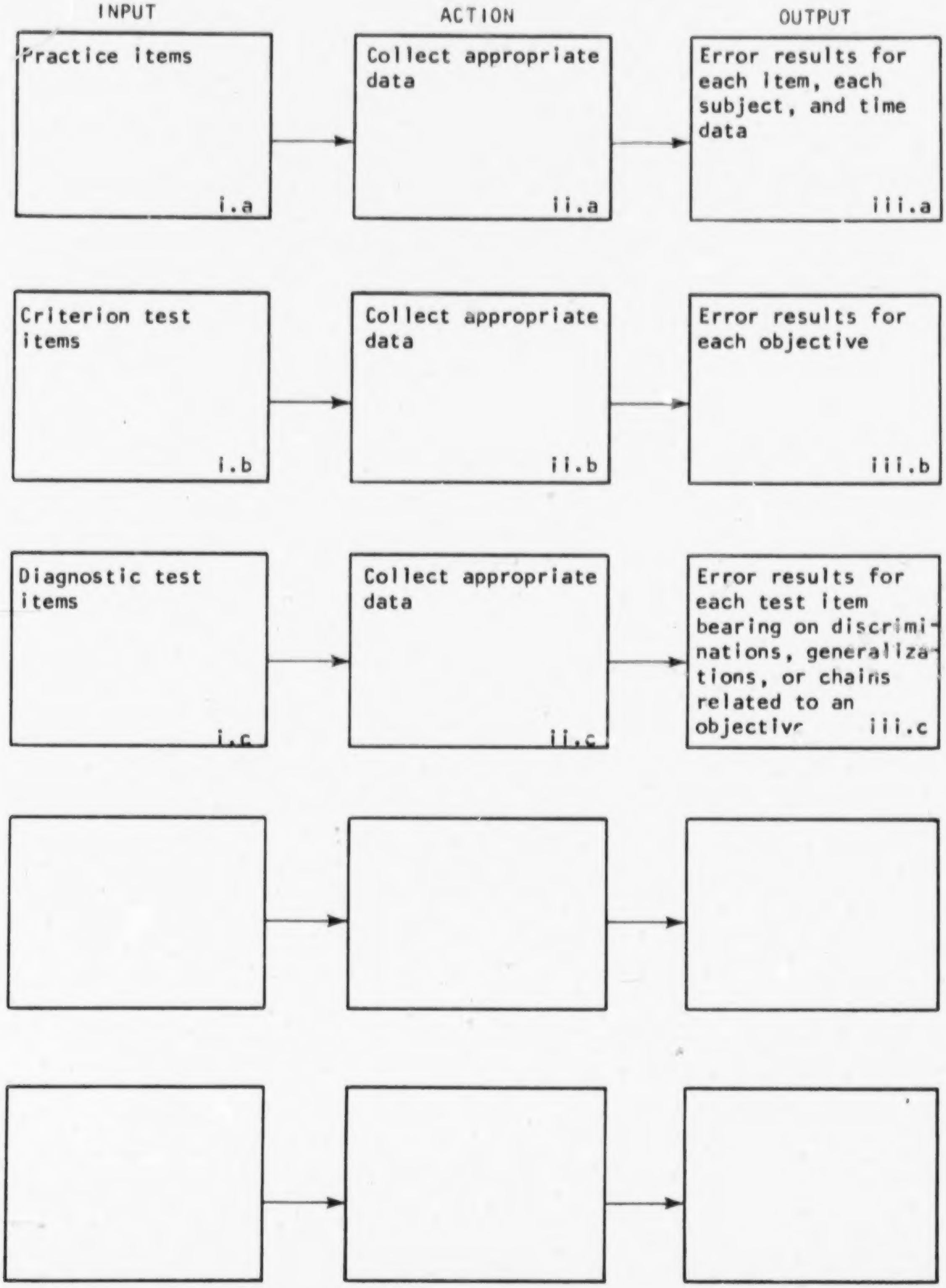

INPUT
ACTION
OUTPUT
SUB-STEP 14.1
Tryout results
i
Analyze results
ii
Pattern of tryout results
iii

ON NEXT 1 PAGE

from

step	14.1
cell	i
page	192

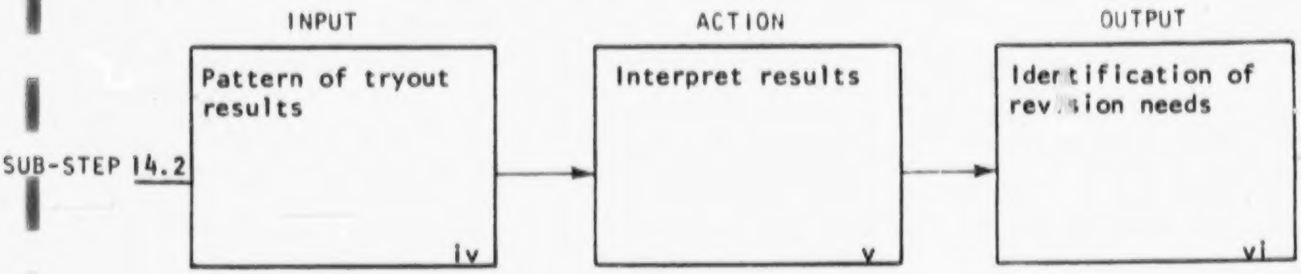
MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS


INPUT
ACTION
OUTPUT
Practice items
i.a
Collect appropriate data
ii.a
Error results for each item, each subject, and time data
iii.a
Criterion test items
i.b
Collect appropriate data
ii.b
Error results for each objective
iii.b
Diagnostic test items
i.c
Collect appropriate data
ii.c
Error results for each test item bearing on discriminations, generalizations, or chains related to an objective
iii.c

from

step	14.2
cell	iv
page	192

DETAILED ANALYSIS FOR

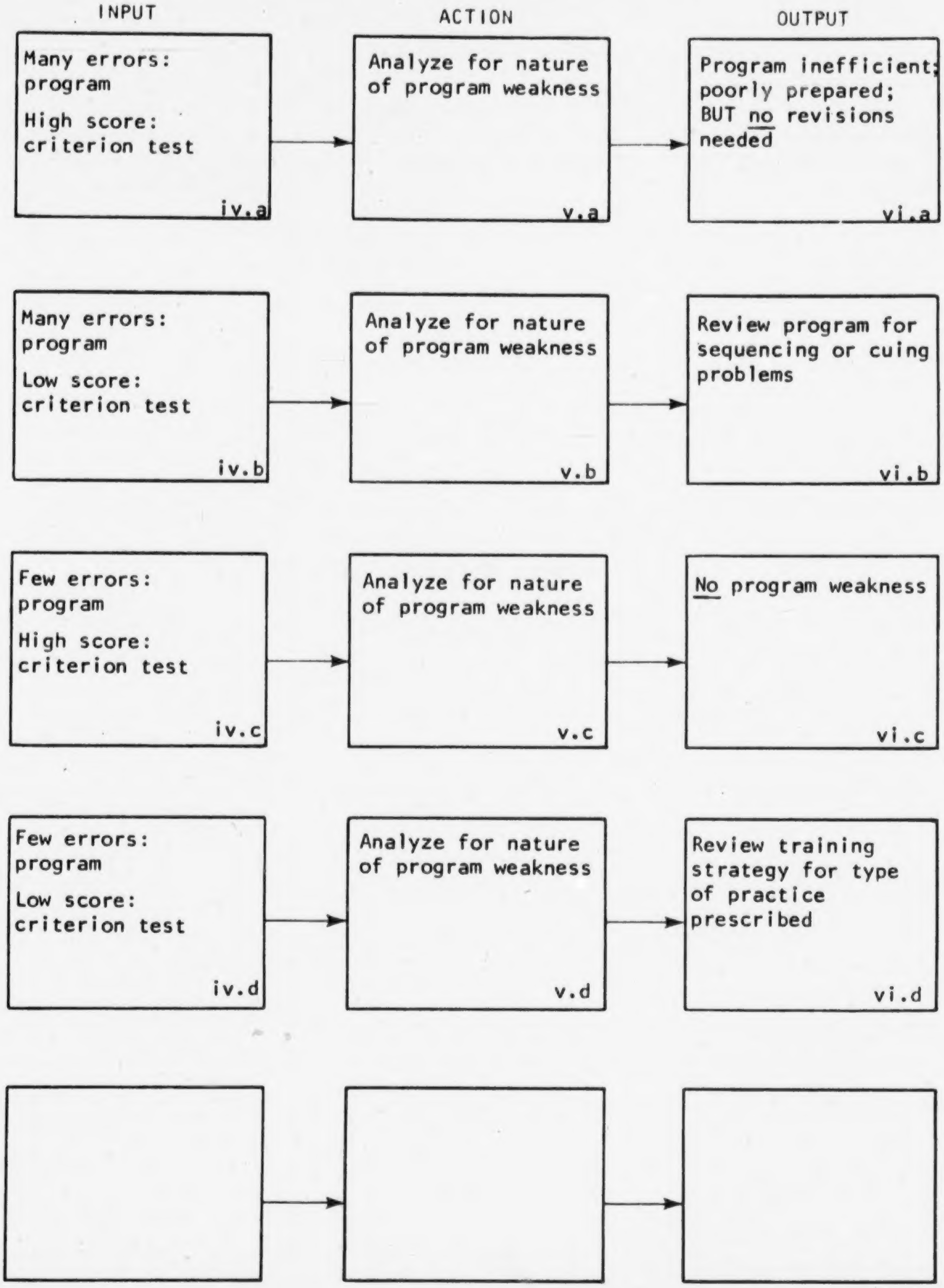

INPUT
ACTION
OUTPUT
Pattern of tryout results
Interpret results
Identification of revision needs
SUB-STEP 14.2
iv
v
vi

ON NEXT 4 PAGES

from

step	14.2
cell	iv
page	192

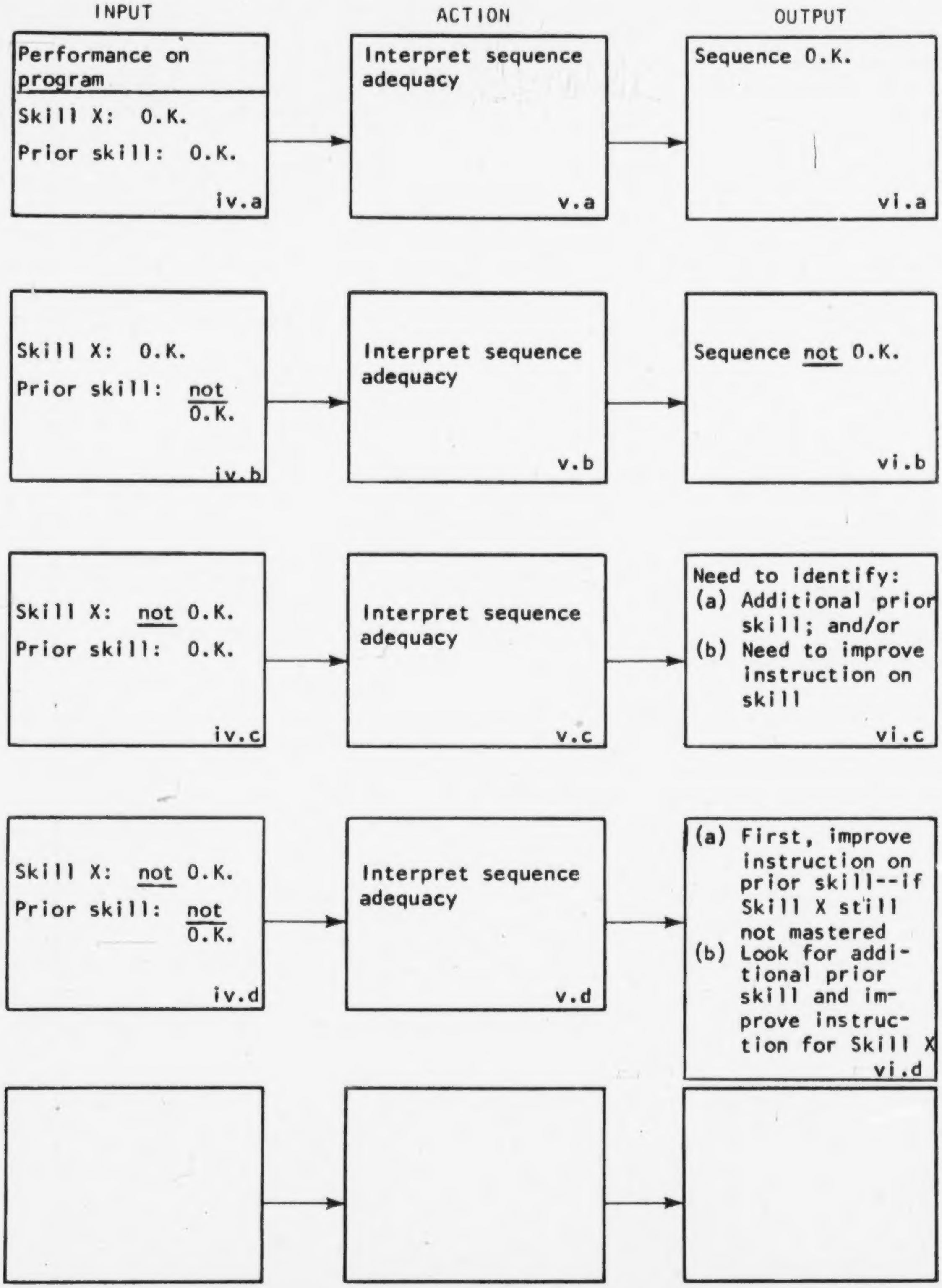
MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS (1)


INPUT
ACTION
OUTPUT
Many errors: program
High score: criterion test
iv.a
Analyze for nature of program weakness
v.a
Program inefficient; poorly prepared; BUT no revisions needed
vi.a
Many errors: program
Low score: criterion test
iv.b
Analyze for nature of program weakness
v.b
Review program for sequencing or cuing problems
vi.b
Few errors: program
High score: criterion test
iv.c
Analyze for nature of program weakness
v.c
No program weakness
vi.c
Few errors: program
Low score: criterion test
iv.d
Analyze for nature of program weakness
v.d
Review training strategy for type of practice prescribed
vi.d

from

step	14.2
cell	iv
page	192

MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS (2)

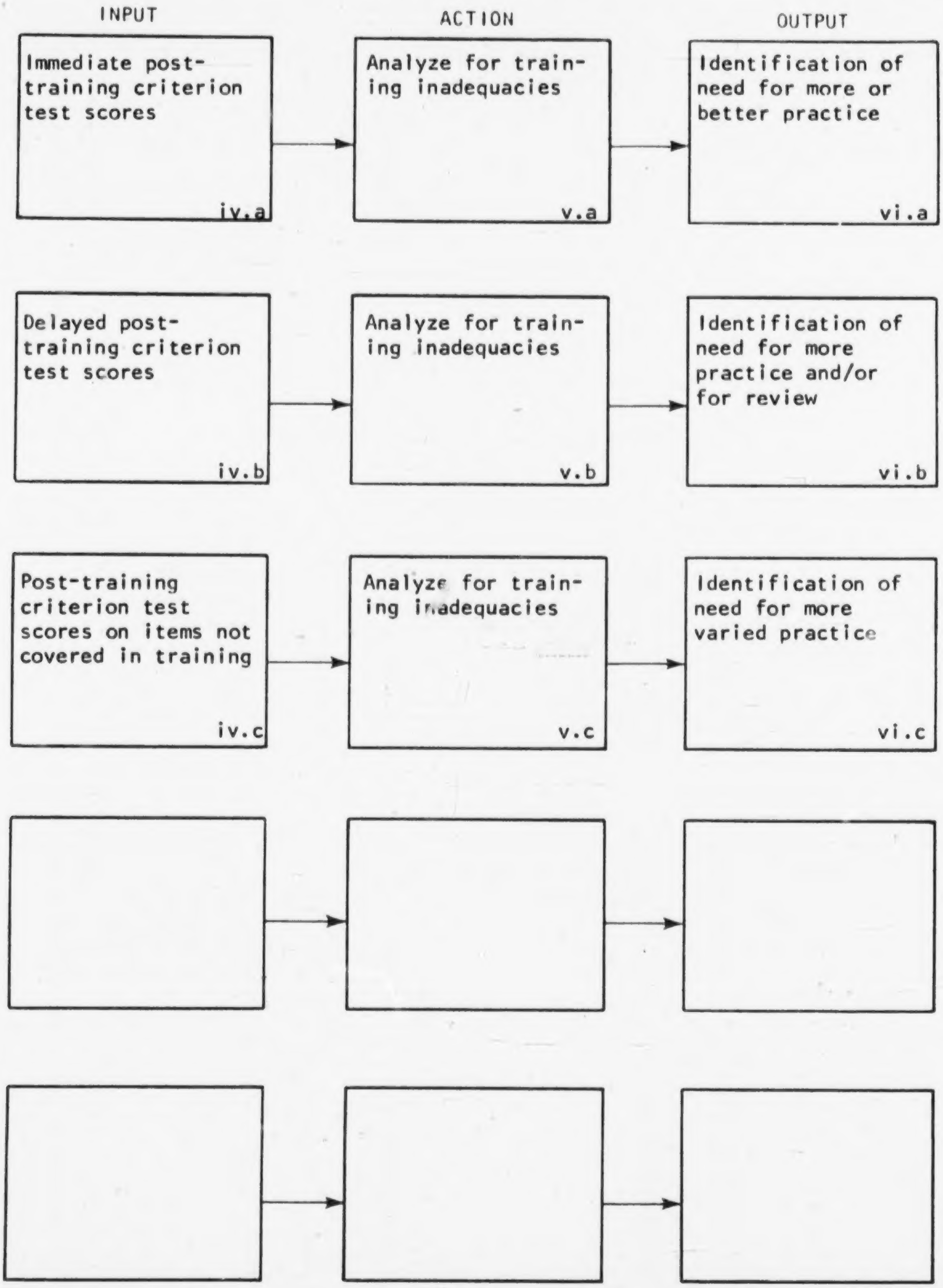


INPUT	ACTION	OUTPUT
Performance on program Skill X: O.K. Prior skill: O.K. iv.a	Interpret sequence adequacy v.a	Sequence O.K. vi.a
Skill X: O.K. Prior skill: not O.K. iv.b	Interpret sequence adequacy v.b	Sequence not O.K. vi.b
Skill X: not O.K. Prior skill: O.K. iv.c	Interpret sequence adequacy v.c	Need to identify: (a) Additional prior skill; and/or (b) Need to improve instruction on skill vi.c
Skill X: not O.K. Prior skill: not O.K. iv.d	Interpret sequence adequacy v.d	(a) First, improve instruction on prior skill--if Skill X still not mastered (b) Look for additional prior skill and improve instruction for Skill X vi.d

from

step	14.2
cell	iv
page	192

MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS (3)

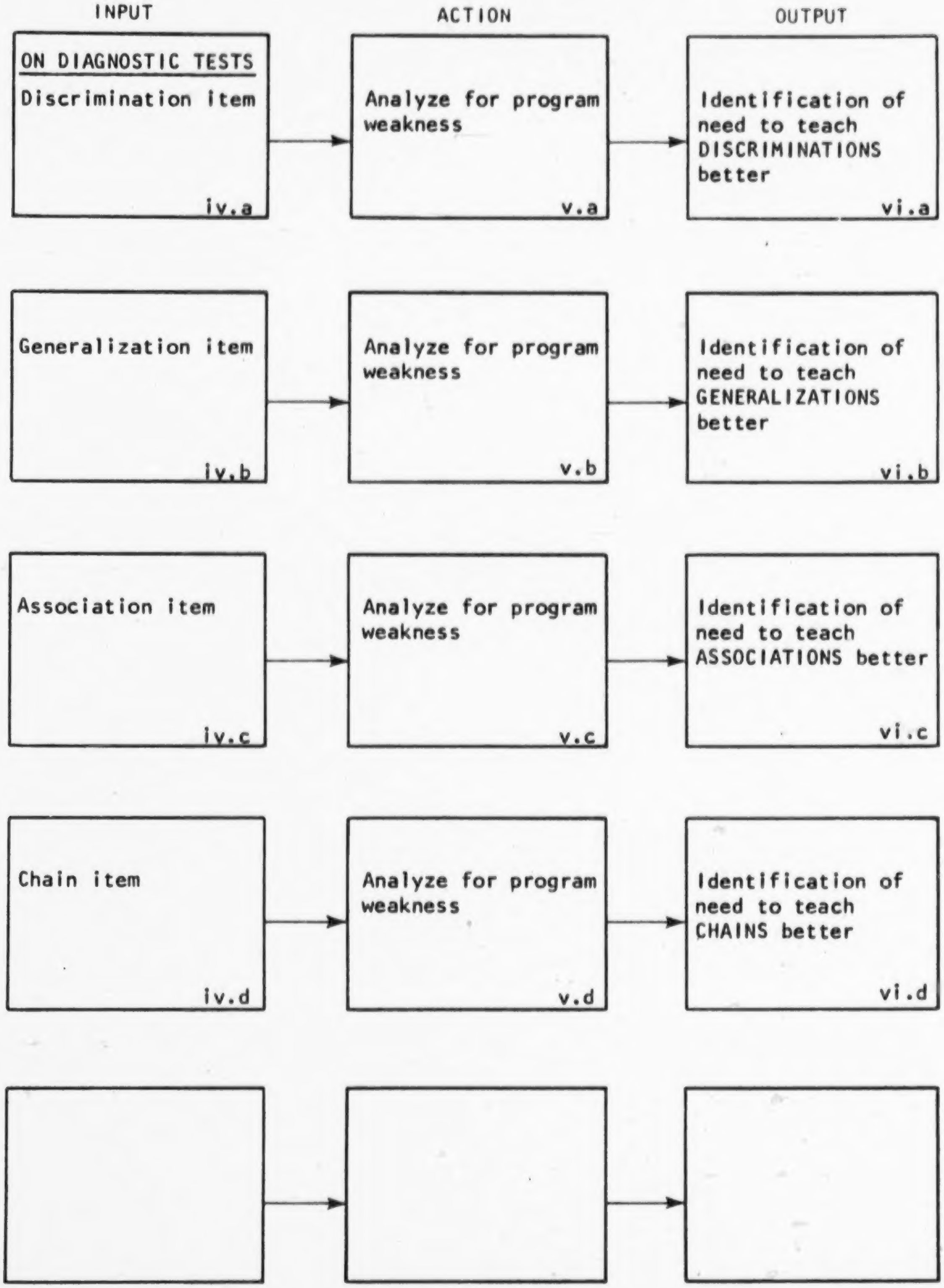


INPUT	ACTION	OUTPUT
Immediate post-training criterion test scores iv.a	Analyze for training inadequacies v.a	Identification of need for more or better practice vi.a
Delayed post-training criterion test scores iv.b	Analyze for training inadequacies v.b	Identification of need for more practice and/or for review vi.b
Post-training criterion test scores on items not covered in training iv.c	Analyze for training inadequacies v.c	Identification of need for more varied practice vi.c

from

step	14.2
cell	iv
page	192

MORE DETAILED
DIAGRAM FOR DISCRIMINATIONS (4)

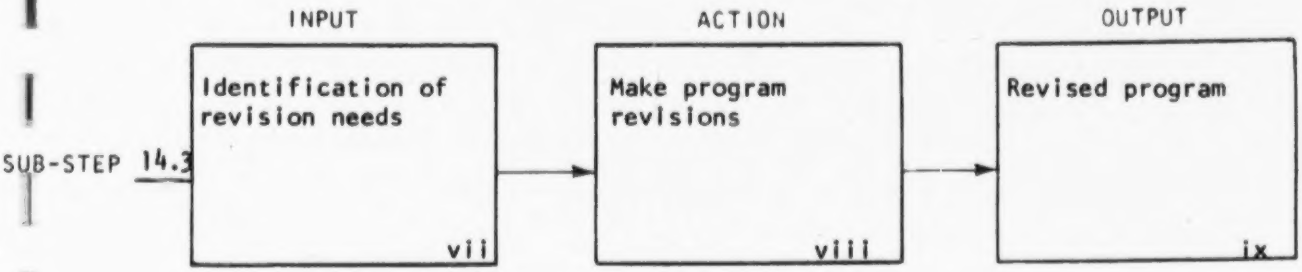


INPUT	ACTION	OUTPUT
ON DIAGNOSTIC TESTS Discrimination item iv.a	Analyze for program weakness v.a	Identification of need to teach DISCRIMINATIONS better vi.a
Generalization item iv.b	Analyze for program weakness v.b	Identification of need to teach GENERALIZATIONS better vi.b
Association item iv.c	Analyze for program weakness v.c	Identification of need to teach ASSOCIATIONS better vi.c
Chain item iv.d	Analyze for program weakness v.d	Identification of need to teach CHAINS better vi.d

from

step	14.3
cell	vii
page	192

NO DETAILED ANALYSIS FOR

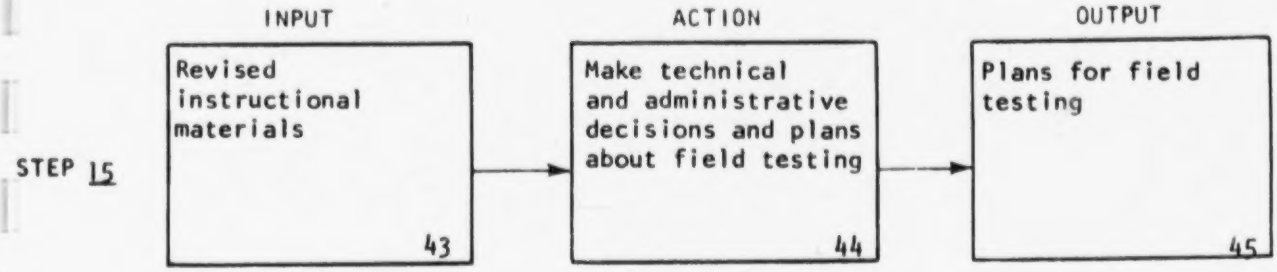

INPUT
ACTION
OUTPUT
SUB-STEP 14.3
Identification of revision needs
vii
Make program revisions
viii
Revised program
ix

FOLD BACK
PAGE 191.

from

step	15
cell	
page	3

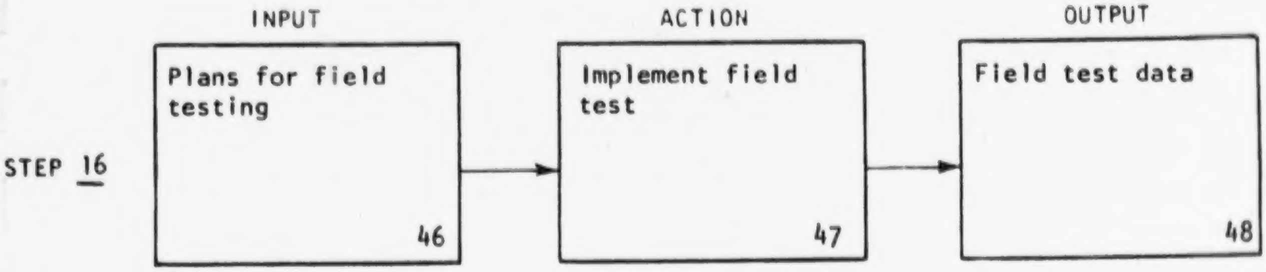
NO DETAILED ANALYSIS FOR


INPUT
ACTION
OUTPUT
STEP 15
Revised instructional materials
43
Make technical and administrative decisions and plans about field testing
44
Plans for field testing
45

from

step	16
cell	
page	3

NO DETAILED ANALYSIS FOR


INPUT
ACTION
OUTPUT
STEP 16
Plans for field testing
46
Implement field test
47
Field test data
48

B

SECTION B

AN INSTRUCTIONAL STRATEGY TO GUIDE THE DEVELOPMENT OF AN EDUCATIONAL R&D CURRICULUM

A WORKING PAPER

AN INSTRUCTIONAL STRATEGY TO GUIDE THE DEVELOPMENT OF AN EDUCATIONAL R&D CURRICULUM*

George L. Gropper

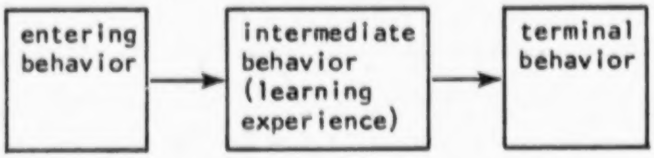
1 October 1970

---

*A summary begins on page 20.

Previous sections of this report have presented a description of seven task flows involved in educational R&D. These include: (1) development, (2) diffusion/implementation, (3) research, (4) evaluation, (5) social interaction, (6) management, and (7) "dealing with issues." Much educational R&D involves an intimate mixture of two or more of these diverse activities. Nevertheless, an impact can be made on education by training some personnel to be able to execute just one complete task flow, by training others to execute just part of one task flow, and, to be sure, by training still others to execute more than one task flow. In each instance, the prescribed task flow represents the terminal performance that is the goal of the proposed training program. The function of an instructional strategy is to identify the prior learning experience necessary if trainees are to achieve the terminal performance.

The purpose of formulating an instructional strategy may be described with the aid of the following diagram.



The training technologist must prescribe the intermediate behavior (learning experience) an educational R&D trainee must exhibit that will help him to bridge the gap between his entering behavior and the behavior the technologist identifies as terminal.

Implicit in the use of the word "behavior" in the term "intermediate behavior" is the assumption that the trainee learns only what he has practiced. The development of the proposed curriculum for educational R&D trainees will explicitly rest on that assumption. Accordingly, the major portion of the curriculum will require trainees to practice the very tasks identified in the work flows as well as other tasks needed to prepare them to do so. Thus, a key training requirement will be that trainees engage in active practice.

Before describing steps taken to formulate detailed strategy decisions, some general training considerations (including the decision to use active practice) should be described. These considerations apply equally to all seven major task flows.

1. General Training Considerations

The current behaviorally oriented instructional technology prescribes, and this report proposes the use of, the following instructional operations as a means of achieving learning effectiveness and efficiency: (a) providing for active responding; (b) selecting responses to be practiced on the basis of behavioral analysis of tasks; (c) prompting response practice; (d) providing feedback; (e) individualizing practice opportunities; and (f) providing for transfer. Each of these operations, and its implications for the proposed curriculum, will be discussed in turn.

a. Providing for active responding. Training development efforts in industry and in the military provide a model for the development of the educational R&D curriculum. In such efforts, trainees practice the very behaviors (in appropriate contexts) that they are expected to exhibit after training. They do not spend major portions of training time engaged in practice verbalizing about the behaviors expected of them. Only to the extent that it can facilitate the acquisition, retention, or transfer of terminal behaviors is verbal practice required of them.

In the proposed curriculum, some trainees will be trained to "deal with issues," which is a verbal performance. Only these trainees will, in addition to practicing the procedural behaviors involved in "dealing with issues," intensively engage in the kind of verbal practice required to acquire knowledge of educational R&D issues. All other trainees (e.g., at the assistant or at the technician level) will engage in verbal practice only to the extent that it can facilitate their learning to perform the procedural tasks involved in the various task flows. Specifically, it is anticipated that this is likely to be the case when trainees are to be trained to be able to transfer what they have learned to a variety of situations. Otherwise, they will concentrate on practice of the actual behaviors involved in the task flows they are to master. In practice, this will mean concentrating on task flows in specially prepared laboratory settings or in realistic intern settings.

Concentration on active practice represents a departure from traditional instruction in education. Concentration on the practice of the very behaviors required at the end of instruction, rather than on principles about those behaviors, represents a still greater departure.

b. Selecting responses to be practiced on the basis of the behavioral analysis of tasks. The behavioral analysis of tasks, that is to say, the identification of the discriminations, generalizations, and chains involved in task flows, is central to the proposed approach to the development of an educational R&D curriculum. On the basis of such an analysis, strategy formulations can, in its prescriptions for active practice, identify: (1) the range of practice situations involving terminal performance it must provide; and (2) the types of prior practice situations likely to be necessary to prepare trainees to engage in the practice of terminal performance tasks. Examples of each of these kinds of prescriptions follow.

(1) Range of "terminal" practice situations. In the development process, an R&D person might be faced with instructional situations calling for the preparation of practice items either at the recognition level, or at the editing level, or at the production level. In his training, he must be given the opportunity to encounter each of these three situations (so that he can make the appropriate discriminations). He must also be allowed to encounter multiple examples of each situation (so that he can make the appropriate generalizations). The purpose of behavioral analysis is to identify these types of situations so that they can be sampled by the trainee during his training.

Ideally, each major type of situation should be encountered in isolation from the other types, just as would be the case if the trainee were on the job. Exposure at one point in time to more than one type of situation would provide the trainee with cues or prompts that would facilitate the required discrimination or generalization. Since no such aid is found on the job, the practice during training that is most like on-the-job performance, i.e., the practice of terminal performance, should also offer no such aid. When prepared to do so, trainees taking the proposed curriculum will be expected to follow a task flow unaided.

(2) Prior practice of non-terminal types of tasks. Behavioral analysis serves to identify the prior kind of practice that can prepare trainees to engage in unaided practice. By identifying discriminations that are difficult to make, or by identifying conditions under which trainees are likely to make generalization errors, or by identifying chains (performance sequences) that are likely to produce errors, behavioral analysis aids the training technologist to formulate the kind of preparatory practice that will avoid these possibilities. So, for example, he might simultaneously present contrasting situations (unlike the terminal performance which contains but one situation) to aid the trainee to make the necessary discrimination. In the case of selecting the appropriate mode of response, the trainee might be faced with two situations (to be discriminated), one calling for recognition responses, the other calling for production responses.

Behavioral analysis serves to identify learning tasks that may prove difficult and for which the training technologist must formulate a strategy prescribing the kind of preparatory practice that enables the trainee to engage in terminal performance.

c. Prompting response practice. Trainees cannot be expected to practice terminal tasks or preparatory, non-terminal tasks correctly without some form of initial cuing or prompting. Such initial assistance may simply consist of a model demonstration immediately imitated by the trainee. Or, it may consist of a highly detailed checklist which he can refer to as he procedes step by step through any of the R&D tasks. Whatever form cues or prompts may take, it is axiomatic that, in the interest of instructional, and hence learning, efficiency, the trainee only be given as little assistance as is needed to produce the desired performance. It is also axiomatic that assistance ultimately be totally withdrawn and that it be withdrawn as soon as the trainee can perform without it.

The value of active practice does not derive simply from the fact that a trainee has simply practiced a response. It derives from the fact that, at some point in training, the earlier the better, he has practiced a response in terminal contexts identical with those he will encounter on the job. This means practice without the aid of cues or prompts. Cues and prompts, of whatever description (some are listed below), serve to reduce the likelihood that the trainee will make errors early in training which he will subsequently have to unlearn. They also serve, when they are carefully chosen and when they are withdrawn gradually, to prepare him to perform at the end of training without their aid. Thus, strategies must not only identify what type of assistance to provide and when to provide; they must also identify when and how to fade out their use.

Assistance can be provided the learner in a variety of ways. Some of the ways to be considered for use in the proposed curriculum are listed or exemplified below.

--Types of cues provided

- -Demonstration of a target performance
- -Presentation of advance organizers
  (e.g., statements of objectives)
- -The use of diagrams to cue responding
  (e.g., diagrammatic representation of the behavioral analysis of a task)
- -Alteration of stimulus mode
  (e.g., use of visual or concrete example rather than a verbal or abstract example)
- -Controlling the sequence of stimulus mode presentation
  (e.g., concrete before abstract)

--Degree of cuing and timing of its withdrawal

- -(See above)

--Magnitude of responses practiced

- -Reducing the magnitude of a task practiced at any given moment (i.e., reducing the operant span)

--Mode of responses practiced

- -Requiring a less difficult mode of response

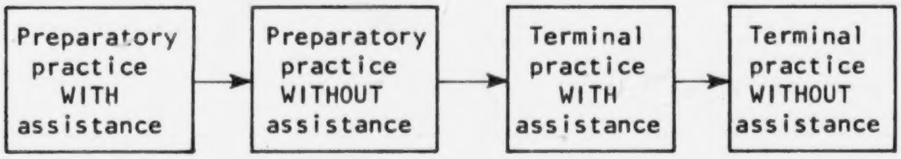
  (e.g., requiring recognition rather than production practice)
- -Sequencing mode of response to progress from easiest to most difficult

  (e.g., recognition, editing, and only then, production)

--Sequencing of tasks to be practiced

- -Backward chaining of tasks

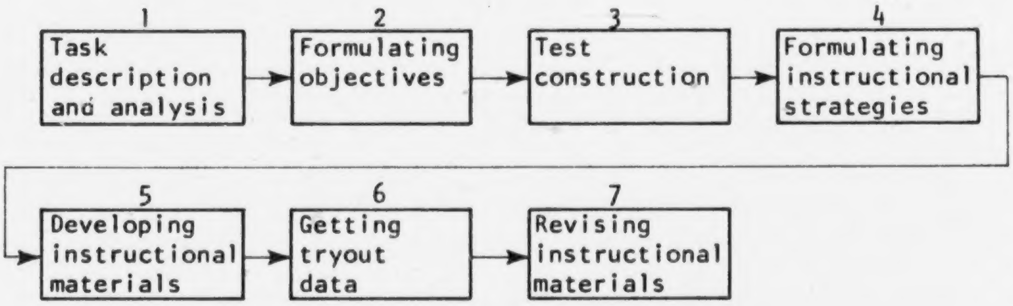
These various types of assistance can be (and will be) used individually or in combination. They will be used not only to facilitate practice of the terminal performance, but also the prior, preparatory practice which itself is designed to be a facilitator. The progression of training which uses such assistance techniques may be diagrammed as follows.


Preparatory practice WITH assistance
Preparatory practice WITHOUT assistance
Terminal practice WITH assistance
Terminal practice WITHOUT assistance

d. Providing feedback. Feedback about the correctness of a response a trainee has just made may occur in one of two ways. The trainer can provide it; or, the trainee can provide his own. Having had prior training in discriminating between correct and incorrect products (stimuli produced by his own responses), the correctness of a product thus can provide feedback about the correctness of the response which produced it. Perhaps the strongest argument in favor of the use of such self-provided feedback is that it is precisely the kind of feedback the trainee will require when he is on the job. Thus, to the extent that training simulates the job, the more likely will transfer to the job occur.

The argument offered in support of backward chaining as a training strategy centers primarily on its feedback capability. Having learned the last step in a chain, the learner then learns the next to last step and the last step provides him with feedback about correctness. Backward chaining is particularly appropriate when procedural skills are being taught (e.g., tying a shoe lace, doing an experiment, doing long division, etc.). Typically, the chain is viewed in molecular detail so that steps which follow one another (and taught in a backward order) are quite small. In the case of long division, the steps taught in a backward order are: getting the remainder, subtracting the last product, etc. A case can be made for teaching procedural skills, such as those as are involved in diffusion or evaluation or research, in a backward order but at a more molar level of detail.

A molar level of detail may be illustrated with major steps in the development process


1
Task description and analysis
2
Formulating objectives
3
Test construction
4
Formulating instructional strategies
5
Developing instructional materials
6
Getting tryout data
7
Revising instructional materials

Treating each of the seven developmental tasks as a major step, a strategy being considered in the proposed educational R&D curriculum calls for teaching the tasks in a backward order. Thus, for example, the trainee would learn first to revise instructional materials before learning how to get tryout data or how to prepare instructional materials. (It is also possible to teach the detailed tasks within each of the seven major tasks in a similar, backward order.) Having learned to perform a consequent task, the trainee can provide his own feedback about the correctness of the just prior task.

Another major advantage of this backward order (other than the feedback it provides) not usually discussed is the repeated exposure of the learner to the practical and concrete contexts in which each major task is being performed. In the proposed approach, in teaching a trainee to perform task #7, he would be presented with pre-prepared products of tasks #1-6. He would be expected to perform task #7 (with whatever assistance might be necessary). By the time he is ready to learn to perform task #4 (formulating instructional strategies), the program will have presented him with a wide range of instructional strategies. In addition, their relationships to the major tasks both preceding and following will have been amply demonstrated. Learning how to formulate one's own strategies should proceed more effectively and efficiently. The backward chaining approach not only provides feedback; it also provides prompting (see previous section) which facilitates the learning of tasks early in the chain. In a word, it encourages the trainee's "modeling" behavior.

e. *Individualizing practice opportunities*. It is proposed that the learning experience trainees undergo to achieve the *same* training goal (e.g., project director in curriculum development) be individualized. (Training for different goals, e.g., diffusion or evaluation, will obviously require some differing learning experiences). It is proposed that all trainees seeking the *same* training goal also be required to undergo a *fixed* (non-individualized) core curriculum. A rationale for and the implications of each recommendation will follow a description of ways in which learning experiences are individualized and those that are unvarying may be beneficial for educational R&D trainees.

(1) *A core curriculum*. For each of the major training programs (e.g., a curriculum development program or a diffusion/implementation program), it is proposed that a core curriculum be developed. The core would train trainees to perform all the procedures or tasks involved in these functions covered by the programs (e.g., how to develop a curriculum). Training beyond the core would consist either of additional and more intensive practice in the very same tasks covered by the core or of specialization in a more circumscribed set of tasks (e.g., formulating objectives, or constructing test items, or preparing instructional materials, etc.). For those trainees being trained to deal with conceptual issues, additional training will concentrate on courses devoted to issues (e.g., problems in formulating instructional strategies).

It is proposed that all personnel within a given program (e.g., curriculum development), no matter what their level of specialization, from technician to project director, take the same core program. It is also proposed that they all take the core for the other programs (e.g., for diffusion/implementation). The advantages stemming from this approach are seen as follows. Trainees completing such core materials will:

--Be capable of becoming switch hitters with further training should this be necessary

--Be capable of specializing in other functions at a later date

--Be capable of communicating and cooperating with other personnel at differing levels of specialization within their own function

--Be capable of communicating and cooperating with personnel in other functions.

(2) An individualized curriculum. Training can be individualized on the basis of the trainees' own decisions and choices and on the basis of what trainers decide. (Administering fixed, core materials is obviously a trainer, not a trainee, decision.) Decisions can concern: what kind of training to receive, how much to receive, what alternative paths to take, how long training should last (or how fast it should proceed). Pre-training results on screening tests, trainee goals and preferences, and rational decisions about effective paths to achieve training goals can all jointly contribute to designing individualized programs for each trainee. So designed, programs are more likely to maintain trainee motivation and to insure training effectiveness.

f. Providing for transfer. Arranging practice conditions that will facilitate transfer to the on-the-job situation is relatively easy to prescribe. Provide practice opportunities that sample all the relevant contexts and relevant responses to them; and, in addition, make the sample varied and large. The purpose of using laboratory exercises or work in intern settings is to provide a sufficient amount and a sufficient variety of examples that will not only assure a high level of proficiency but also the transfer of the skills that comprise it to the range of situations likely to occur on the job.

2. Five Key Strategy Decisions for Achieving Five Training Goals

Strategy decisions are concerned primarily with ways to achieve five major goals, goals which appear in the left-hand most column of Table 1 appearing on the next page. These goals include: (a) trainee acquisition of relevant skills involved in terminal performance; (b) trainee acquisition of component skills that prepare the way for terminal performance; (c) trainee retention and transfer of terminal skills; (d) assuring trainee attention and observation during training to permit all of the first three goals; and (e) assuring that trainees will exhibit skills they have acquired.

To achieve these training goals, the trainer must specify relevant responses to be practiced, the stimulus contexts in which they are to be practiced, the stimulus cues that make possible response practice which is correct, stimuli that can serve as reinforcers, and finally, media that allow for practice of relevant responses and presentation of relevant stimuli. These specifications will be described briefly for each of the training goals--as they apply to the proposed curriculum.

a. Acquisition of terminal skills. The strategy most likely to succeed in bringing about the acquisition of terminal skills, no matter what type of skill is involved, is the actual practice of those skills. Actual practice may, however, be contraindicated for reasons of administrative, logistical, or financial unfeasibility. Actual practice involving interpersonal relations may also be unfeasible if, thereby, the relations may be impaired. Therefore, in prescribing what terminal practice should be like, the technologist follows these five steps: (1) he characterizes the stimuli and responses involved in terminal performances; (2) he applies criteria of feasibility in building these elements into training; (3) he makes decisions whether to build them in or whether to use simulation instead; (4) he selects media that can present the decided-upon elements; and (5) he builds courses around these media.

A tentative application of this process to the proposed curriculum appears in Table 2 on page 13. It is tentative because all the necessary components of the decision process will become available

TABLE I. COMPONENTS OF INSTRUCTIONAL STRATEGIES

	To Achieve These TRAINING GOALS		1 Characterize	2 Identify RESPONSES To Be Practiced		3 Identify STIMULI To Be Presented	4 Identify MEDIA That Allow 2 and 3
I	Acquisition of terminal skills	Do the following	Practice of terminal performance	-Mode { Motor, verbal, procedural production recognition } -Real versus simulated	+	-Mode (visual, verbal) -Real versus simulated	Media that can present people, objects, events as STIMULI and that allow practice of relevant RESPONSES
II	Facilitating learning of component skills: discriminations, generalizations, and chains	Do the following	Preparatory practice to overcome learning difficulties	-Mode of response -Sequence of response -Size of response unit	+	-Stimulus mode -Stimulus types -Stimulus amount (cuing)	As in I above
III	Facilitating retention and transfer of terminal skills	Do the following	Amount and spacing of additional practice of terminal performance	As in I above	+	As in I above	As in I above
IV	Facilitating attending and observing behavior during practice	Do the following	Necessary attending and observing behavior	-Type of responses to be made -Timing of responses	+	-Stimuli that already control required types of responses	As in I
V	Facilitating exhibition of skills beyond training setting	Do the following	Necessary reinforcement contingencies to be completed during and beyond training practice		+	Stimuli to serve as reinforcers following practice of responses during training and following their exhibition beyond training	Media that can present relevant STIMULI

TABLE 2: PRESCRIPTION FOR TERMINAL PRACTICE

	1	2	3	4	5
FIVE STEPS	Characterize Terminal Performance Nature of stimuli: -Objects, people, events, or symbols -Senses involved -Visual/verbal Nature of responses -Verbal, motor, procedural, perceptual -Production, recognition	Assess Need for Simulation Apply criteria to use of terminal stimuli and responses: -Cost (time, salaries, downtime) -Administrative convenience -Physical or psychological disadvantages	Prescribe Character of Practice Prescribe real vs. simulated stimuli and responses	Identify Media Requirements Prescribe media required to: -Present stimuli selected -Allow response practice selected	Characterize Probable Courses Type of course required for type of practice selected: -Reading and writing materials -Lecture -Lab work -Internship
APPLIED TO	1	2	3	4	5
Development Diffusion/ Implementation Research Evaluation	TYPE A Stimuli: educational problems presented by printed words Responses: writing words solving educational problems in writing	TYPE A No need for simulation	TYPE A Use actual printed materials	TYPE A Paper-and-pencil exercises	TYPE A First: artificial paper-and-pencil exercises (e.g., programmed) Later: work in internships
	TYPE B Stimuli: people (e.g., tryout subjects or teachers) Responses: administering tests or interacting with them)	TYPE B Probable need for simulation, early in training; later, deal with real people	TYPE B -Printed case studies; or -Role play situations with fellow trainees -Last, real students	TYPE B -Paper-and-pencil games, live classroom situations	TYPE B -Programmed exercises -Labs (for role-playing) -Internships with actual students
Management Social Interaction	As Per Type B Above	As Per Type B Above	As Per Type B Above	As Per Type B Above	As Per Type B Above
	TYPE C Stimuli: objects Responses: buying, using	TYPE C Early: simulation Ultimately: real objects	TYPE C Early: printed descriptions Ultimately: rea equipment	TYPE C Early: paper-and-pencil Ultimately: live situation	TYPE C Early: programmed Ultimately: internships
Dealing with Issues	As Per Type A Above	As Per Type A Above	As Per Type A Above	As Per Type A Above	As Per Type A Above

only during the operational phase of the development effort. Table 2, while containing decisions likely to hold up, is meant to be illustrative. This can also be said for the remaining strategy considerations which follow.

Table 2 reveals that, because a good deal of the educational R&D effort revolves around paper-and-pencil solutions to instructional problems, it will be possible to concentrate on them during training. It is anticipated that at first, paper-and-pencil problems will be artificial, in the sense that they are prepared specifically for the training setting. To the extent that the problems will require all relevant procedural operations, they cannot be considered artificial. Later practice, in internship settings, will approximate what trainees are expected to encounter on the job.

The sequence of decisions involved in the prescription just described is presented in more detail in Table 2.

b. Acquisition of preparatory skills. In some training situations, the trainee can engage in the practice of terminal skills immediately following a demonstration of them. In other situations, likely to be the case most of the time, the trainee needs to engage in some kind of prior, preparatory practice before he is ready to engage in the practice of terminal skills (terminal skills, once again, meaning performing tasks in a task flow as the person would on the job). Preparatory practice is apt to be unlike the job and artificial in the sense that it: (1) concentrates on components of terminal skills (e.g., discriminations, generalizations, or chains); (2) deals with the components in a specialized, non-joblike way (e.g., teaches discriminations using paired comparisons); and (3) makes heavy use of techniques to cue or prompt performance. The primary purpose of such artificial treatment of job tasks is to prepare the trainee ultimately to be able to perform job tasks without any artificial aid.

Prescribing for preparatory practice requires that the technologist: (1) characterize the nature of the learning difficulties that may prevent the correct practice of terminal skills (e.g., difficult discriminations or generalizations); (2) prescribe training techniques to overcome such difficulties; (3) characterize practice that uses such techniques; (4) identify media that make such practice possible; and (5) characterize the courses that are built around such media utilization.

Table 3 summarizes this five-step procedure--as it applies to the development of the proposed curriculum. Again, in the absence of complete data to support necessary decisions, the prescription is merely illustrative.

From Table 3, it appears that specifications for preparatory practice are likely to share common elements with those for terminal practice. Paper-and-pencil exercises are likely to accomplish the bulk of the goal of facilitating the learning of component discriminations, generalizations, and chains. Practice in internship settings are not likely to be sufficiently artificial (i.e., specially designed) to provide the kind of practice necessary to overcome learning difficulties associated with the acquisition of relevant discriminations, generalizations, and chains. Therefore, it is proposed that the bulk of the required preparatory practice be accomplished by means of core programs (probably paper-and-pencil programmed texts) administered early in training.

c. Retaining and transfering terminal skills. An illustrative prescription is offered in Table 4 for the type of practice likely to be necessary to assure that trainees will retain the skills they have learned and will also transfer them to whatever new (unsampled in training) situations they will encounter on the job. In effect, the prescription recommends for purposes of retention additional practice of terminal skills (e.g., in internship settings) and for purposes of transfer, varied practice opportunities (e.g., both in paper-and-pencil practice and in practice in internship settings).

TABLE 3: ILLUSTRATIVE PRESCRIPTION FOR PREPARATORY PRACTICE

	1	2	3	4	5
FIVE STEPS	Characterize Learning Difficulties Problems in acquiring: -discriminations -generalizations -chains Problems in going from entering to terminal performance	Prescribe Solutions to Learning Problems Prescribe cues to be used -Prescribe types of responding (e.g., recognition, editing, or production) -Prescribe operant span -Prescribe sequence of practice -Alter stimulus or response mode	Prescribe Character of Preparatory Practice -Block out type of preparatory practice -Prescribe nature of stimuli and responses	Identify Media Requirements Prescribe media required to: -Present stimuli selected -Allow practice of selected responses	Characterize Probable Courses Identify type(s) of courses for required types of practice
APPLIED TO	1	2	3	4	5
Development Diffusion/ Implementation Research Evaluation Management Social Interaction Dealing with Issues	As for any terminal performance, characterize difficulties: -Discriminations -similarity/dissimilarity among stimuli -number of stimuli to be discriminated -number of properties forming the basis for discrimination -Generalizations -as for discriminations -Associations -number to be learned -strength of existing associations that offer competition -Chains -length	For all components: -Before production, require editing and/or recognition practice Present principles which are correct practice Manipulate terminal situations to make them easier; e.g., wide differences among stimuli before various ones Use concrete descriptions before abstract ones in case studies	a. Stimuli and responses are likely to be the same as those in terminal performance b. Mode may be changed to make learning easier, e.g., visual rather than verbal examples, or use of diagrams	a. Paper-and-pencil texts b. On-the-job settings (internships)	a. Preparatory practice is likely to be confined to a CORE printed program b. The remaining practice is likely to be concerned with additional and varied examples in laboratory or internship settings

T/ 4. LUS IVE ESCI ION PR CE ESS FOR ENT AN ANS

	1	2	3	4	5
FIVE STEPS	Characterize Range of Job Situations to Be Encountered -Types of goals Characterize Retention Problems -How long to be retained -Will job aids be available	Assess Requirements for Review and Varied Practice	Prescribe Required Practice -Identify specifications for massing or spacing of review of practice of terminal skills -Identify specifications for variety of examples in original and review practice	Identify Media Requirements Media requirements as for original terminal practice	Characterize Probable Courses -Types of courses: as for original terminal practice (except additional hours)
APPLIED TO Development Diffusion/Implementation Research Evaluation Management Social Interaction Dealing with Issues	-Wide range of educational goals likely to be encountered on jobs: e.g., reading, writing, arithmetic, languages, sciences, teacher training, etc. -Job aids not likely to be available on job (other OE projects may provide some, e.g., 70-27 projects) -Long-range retention required	-Wide range of examples should be sample -A large number of practice opportunities should be provided -If no job aids are to be available, practice requirements increase	Same as for terminal practice	Same as for terminal practice	Same as for terminal practice

d. Attending and observing during both terminal and preparatory practice. Trainees cannot engage in effective terminal or preparatory practice unless they attend to the right stimulus materials at the right time and in the right sequence. Additional stimulus materials must be introduced which can elicit and control such attending behavior. Candidates for such functions include: statements of objectives, diagrams, numbered steps, instructions, etc. Some illustrative recommendations for the proposed curriculum (and the process for arriving at them) are presented in Table 5.

e. Exhibiting terminal skills on the job. The four training goals just discussed are all concerned with instructional techniques and operations designed to see to it that trainees can acquire, retain, or transfer R&D skills. Having acquired the skills is no guarantee that trainees will put them to work. Still other techniques are required to guarantee that.

Suitable contingencies of reinforcement must be identified that will insure that: (a) trainees will engage in practice necessary for the acquisition of skills; and (b) trainees will exhibit those skills beyond the training setting. During training, such extrinsic reinforcers as grades, degrees, prospects of landing jobs or of advancing on jobs can be expected to reinforce trainee practice of skills. Not least among potential extrinsic reinforcers are stipends.

Intrinsic reinforcers are somewhat more difficult to arrange, partly because of individual differences among trainees, but mainly because they are inherently difficult to identify and control. Training can be made "interesting" by providing practice tasks similar to those job tasks found in a person's job or generally by selecting tasks that arouse curiosity or require ingenuity, innovation, or creativity. Intrinsic reinforcement can also be arranged by allowing trainees to experience a sense of accomplishment with practical problems in internship settings. Also within those settings, professional

TABLE 5. ILLUSTRATIVE PRESCRIPTION FOR ASSURING ATTENDING AND OBSERVING BEHAVIOR

	1	2	3	4
FOUR STEPS	Characterize Practice -Describe terminal stimuli and responses (See Table 2, Column 1) -Describe preparatory stimuli and responses (See Table 3, Column 3)	Identify Attention or Observing Problems -Confusions about attending: -What -When -In what sequence	Prescribe Solutions -Prescribe cues that can control attending behavior -Diagrams -Statements of objectives -Instructions	Identify Media Requirements -Prescribe media required to present stimuli used to cue attending behavior
APPLIED TO	1	2	3	4
Development Diffusion/ Implementation Research Evaluation	Symbolic (verbal) stimuli and responses in paper-and-pencil exercises and in practical, internship exercises	-What is nature of task -What is outcome of task (objectives) -How is task to be performed -When and in what sequence is it to be performed	Graphic or verbal cues in paper-and-pencil exercises; verbal cues in internship exercises	Print, audio tape, or live instruction
Management Social Interaction	Simulated games		Verbal cues in simulated games	Print, audio tape, or live instruction
Dealing with Issues	Verbal stimuli and responses (in paper-and-pencil exercises)		Verbal cues in realistic practice	Print, audio tape, or live instruction

performance by experts after which trainees can model their own performance may contribute to the pool of intrinsic reinforcers. And it is precisely this kind of reinforcement which may carry over to the job setting and maintain the skills practiced during training. (No table is presented for this training goal.)

3. Summary and Elaboration

The preceding discussion has identified the major steps involved in strategy formulation and has also provided formulations applicable to the proposed curriculum. To the extent that the data base for those formulations is complete or nearly complete, the formulations can be considered tenable. To the extent that the data base can only be completed during the operational phase, the formulations should be considered illustrative.

There are five major concerns in strategy formulation: how to provide for the practice of terminal skills (skills actually employed on the job); how to provide the kind of prior practice needed to prepare trainees to be able to engage in the practice of terminal skills; how to assure trainee attention during practice; how to assure trainee retention and transfer of skills beyond the training setting; how to assure that trainees, once they leave the training setting, will exhibit the skills they have learned and can perform. Recommendations for each of these problems (as they apply to the proposed curriculum) follow.

The educational R&D tasks (development, diffusion/implementation, research, evaluation, management, and dealing with issues) are basically procedural, problem-solving tasks which deal with symbolic (verbal and quantitative) stimuli and responses. Most of these tasks (on the job) involve the use of paper-and-pencil as media for performing them. PROPOSAL:

> The very same types of symbolic stimuli and responses should be used during practice of the procedural, problem-solving tasks. Media for learning should also include paper-and-pencil activities.
>
> Early in training, programmed printed materials may be used in laboratory-like settings. Later, practice of the same terminal tasks should continue in internship settings. Practice in both settings should be in sufficient amounts, suitably spaced, and with sufficient variety to assure retention and transfer of these terminal tasks.

The terminal educational R&D tasks (listed above) plus "social interaction" also contain non-symbolic stimuli (e.g., people, materials, equipment). It may be administratively, logistically, or psychologically costly to employ them in the practice of terminal skills. PROPOSAL:

> Early in training, simulation of non-symbolic stimuli may be used as a means of avoiding unsupportable costs. Printed case study materials should be used for this purpose. Later in training, when trainees engage in internship activities, they should be allowed to deal with terminal type, non-symbolic stimuli (e.g., tryout subjects, administrators, slides, TV tape).

The terminal educational R&D task "dealing with issues," in addition to its procedural components (e.g., writing a paper on "instructional strategies"), has a comprehensive knowledge component (e.g., being able to identify or to define what an instructional strategy is). PROPOSAL:

> Even for this knowledge component, it is desirable that trainees engage in active practice (e.g., identifying or defining terms). Programmed materials would be the ideal medium for providing this type of practice. However, they are not likely to be available for the operational phase of this project. In lieu of the ideal, conventional lectures, seminars, and/or discussions should be used to deal with the "acquisition of knowledge." To the extent possible, these conventional media should be enriched by the addition of practice exercises.

Before trainees can engage in the practice of the terminal skills involved in the procedural R&D tasks (see above), they are likely to require prior, preparatory practice. Such practice is usually required in most training and is usually artificial. It is artificial to the extent that it deviates from terminal practice. What makes it artificial is that it deals merely with components of terminal skills (i.e., discriminations, generalizations, and chains); it may deal with the components in a non-terminal way (e.g., paired comparisons for practice of discriminations); and it provides prompting not found in terminal practice. Although labeled "artificial," it is the kind of learning experience required to take trainees from entering proficiency to terminal proficiency. PROPOSAL:

Prescribing preparatory practice required the completion of a behavioral analysis of terminal tasks (i.e., identification of all the discriminations, generalizations, and chains) and an identification of barriers to their acquisition, retention, and transfer. Completion of both tasks must await the start of an operational phase.

In the absence of a complete data base from which a prescription can be derived, it is possible to identify some likely features of the preparatory practice likely to be required. Save for those tasks requiring non-symbolic stimuli (i.e., people and objects), preparatory tasks will involve verbal and quantitative stimuli and responses. Paper-and-pencil exercises will be used (most likely in core programs) to provide the kind of practice that can build to terminal performance. Wherever possible, practice exercises will rely solely on demonstation followed by terminal performance. Only as more prompting is required will it be offered. Whenever offered, it will be withdrawn as soon as trainees can perform without it.

Preparatory practice for tasks involving non-symbolic stimuli (i.e., people, objects, equipment, etc.), as in terminal practice simulation, either in verbal case studies or through gaming (e.g., role playing) will be used.

Both during preparatory and terminal practice, a range of techniques will be used to insure attending behavior. These will include such techniques as: verbal instructions, statement of objectives, graphic diagramming techniques, etc.

It is possible to design practice opportunities which, if taken, can lead to proficiency in R&D tasks. But, trainees may not take the opportunities. It is also possible for trainees to engage in the required practice and to achieve desired levels of proficiency and yet fail to put that proficiency to work beyond the training setting. PROPOSAL:

The R&D curriculum should exploit a broad range of intrinsic and extrinsic reinforcers to encourage response practice during training. Reinforcers can consist of such conventional rewards as

> stipends, grades, or degrees. In internship settings, it can consist of such less conventional "rewards" as acquisition of professional skills, a share in authorship, or a share in producing materials that are accepted and make an impact. Practice exercises can contain problems that are relevant to and of interest to individual trainees (a selection of problems should be possible).
>
> To further assure post-training exhibition of skills, working with professionals in internship settings can provide the occasion for trainees to model their own behavior in keeping with an admired example. Performing in a manner comparable to that of the admired professional can, in turn, become intrinsically reinforcing.

Trainees will be expected to perform at different levels of proficiency (e.g., technician, professional assistant, or project director) and to interact with and cooperate with members of a team. Strategy recommendations made so far have concerned performance within a single function and have been general, disregarding the issue of levels. Recommendations are needed for within function differences and for across function cooperation.

PROPOSAL:

> A core program for each function (e.g., development) should be offered all trainees within that function regardless of level. This will enable personnel at differing levels with the function: to communicate with one another, to understand each other's problem and role, and to be eligible for and prepared to acquire additional training to move on to other levels.
>
> Additional training beyond the core (which it is proposed consist of programmed paper-and-pencil materials) consists of additional paper-and-pencil exercises and simulated games, and finally, increasing amounts of internship practice.
>
> For across function communication and cooperation, it is recommended that each trainee, as a minimum, take the core program for each function.

Perhaps, the key difference between the strategy explicitly proposed for the R&D training curriculum and the strategy implicit in currently available programs is the emphasis on active practice. The proposed curriculum will concentrate on the active practice of skills involved in performing R&D tasks. Unlike existing programs, it will not stress verbalization about those tasks. Only for those trainees who will be required to "deal with issues" (e.g., research-oriented personnel or project director types), will verbalization about R&D tasks and R&D issues be prescribed. Even here, practice will be the order of the day. Simply reading about issues is not enough. For trainees to put their training (whether in tasks or in issues) into practice, they must have the opportunity during training actively to do their thing.

ED 080495

FINAL REPORT ON PROJECT TO DESIGN NEW PATTERNS FOR TRAINING R & D PERSONNEL IN EDUCATION (RFP 70-12)

APPENDIX C

EXAMPLES OF APPROACHES TO THE DEVELOPMENT OF COMPONENTS OF TRAINING PROGRAMS FOR EDUCATIONAL R & D PERSONNEL

~~SP 006 784~~
SP 006 777

Learning Research and Development Center

University of Pittsburgh

December 18, 1970

CONTENTS

PAGE

1 . . . . . An Approach to Specifying Training Units Associated With Tasks in the DDU/ER Work Flows. These Illustrations Involve Tasks 1-3 and 17 in the Work Flow for Development: Curriculum or Training Programs. (Prepared by Glen Heathers)

5 . . . . . A Strategy for Teaching Task 9, Prepare Instructional Materials In the Work Flow for Development: Curriculum or Training Programs (Prepared by Lauren Resnick)

9 . . . . . Illustrative Training Materials (Prepared by George Gropper)

AN APPROACH TO SPECIFYING TRAINING UNITS ASSOCIATED WITH TASKS IN THE DDU/ER WORK FLOWS. THESE ILLUSTRATIONS INVOLVE TASKS 1-3 and 17 IN THE WORK FLOW FOR DEVELOPMENT: CURRICULUM OR TRAINING PROGRAMS. (PREPARED BY GLEN HEATHERS)

DEVELOPMENT A: CURRICULUM OR TRAINING PROGRAMS

Task 1: Identify curriculum or training need

a. Specify desirable features for curricula in the areas:

	MEDIA
(1) re learning goals	
Unit on defining types of learning goals (see R & D Foundations task list, Task 13)	Programed
Unit on relations of types of learning goals to individual/societal values: content, process, and personal/social goals	Seminar/ Syllabus
Unit on bases for establishing the set of learning goals for a new curriculum	Programed/ Simulated
Unit on examining taxonomies of learning goals	Syllabus
Unit on "readings in educational values"	Syllabus/ Seminar
(2) re instructional approaches	
Unit on learning theory in relation to instruction (see R & D Foundations task list, Task 14)	Syllabus/ Seminar
Unit on how curricula can take account of different instructional approaches as related to designated learning goals	Syllabus/ Seminar
(3) re provisions for student differences	
Unit describing how curricula can take account of student differences in background, interests, purposes, learning "styles," study competencies, etc.	Syllabus/ Lab
(4) re provisions for facilitating implementation	
Unit on how curricular materials can facilitate implementation: diagnostic and achievement tests, programed learning units, syllabi, teacher guides	Syllabus/ Programed

	MEDIA
b. Examine and evaluate current curricula in the area in terms of the above criteria.	
Unit presenting the analysis and evaluation of a curriculum in terms of the 4 types of criteria: a (1)-(4)	Programed
Unit calling for employing the above model of analysis and evaluation with a set of curricular materials	Lab
c. Identify shortcomings of current curricula in the area	
Unit providing method of identifying leading curricula, a chart form for comparing curricula selected for analysis, and a summary procedure for indicating major shortcomings in existing curricula	Programed/ Syllabus/ Lab
Task 2: Decide to conduct (or not conduct) the development effort	
a. Judgments of importance	
Unit presenting criteria of importance, method of measuring identified curriculum shortcomings against the criteria, and method of arriving at summary judgment of importance of engaging in a curriculum development effort	Programed/ Syllabus
b. Judgments of feasibility	
Unit presenting way of identifying available resources (funds, personnel, support, etc.), of evaluating resources against requirements of the development effort, and of judging feasibility	Programed/ Syllabus
Task 3: Specify major features of the curriculum to be developed	
a. Provisions for classes of learning goals	
Unit on selecting classes of learning goals for the new curriculum that builds on units above and offers trainee systematic approach to examining relevance of different classes of goals and to placing emphasis on goals judged to have highest relevance.	Programed
Unit providing trainee with a set of general purposes that a designated curriculum is to serve with students; trainee is called upon to generate a set of types of learning goals he judges will satisfy these purposes	Lab (Simulation)
b. Provisions for instructional approaches	
Unit teaching trainee to judge relevance of different instructional approaches to the accomplishment of different types of learning goals	Programed/ Syllabus

	MEDIA
c. Provisions for student differences	
Unit teaching trainee how variations in instructional materials and procedures can meet designated individual differences among students and how provisions for such variations can be built into the curriculum	Programed/ Simulation
d. Provisions for facilitating implementation	
Unit teaching trainee how diagnostic and achievement tests, programed learning units, syllabi, teacher guides, etc. can assist in curriculum implementation	Programed/ Lab
a-d Combining provisions a-d	
Unit calling upon trainee to generate a description of the major features of a curriculum he might build in terms of the four types of provisions (a-d above)	Syllabus/ Lab
Task 17: Arrange and conduct a field test under controlled conditions	
a. Specify requirements to be met in the pilot test	
Unit teaching trainee a set of requirements and how they apply to pilot testing an illustrative curriculum	Programed/ Simulation
b. Specify criteria for a pilot test site	
Unit teaching trainee a list of criteria and reasons why they are important	Programed
c. Select the pilot test site	
Unit presenting trainee with data on three potential pilot test sites for a specified curriculum; trainee applies selection criteria, selects one site, and justifies his choice	Simulated
d. Prepare to initiate the pilot test	
1. Make working agreement with pilot test school	
Unit presenting list of items to be covered in making working agreement with the pilot test school and showing in a film simulation how they can be covered in a planning conference with officials of School X	Programed/ Simulation
2. Assemble and organize the pilot test staff	
Unit presenting requirements for staffing a pilot test at School X and offering a film simulation of a conference to plan the membership and organization of the pilot test staff	Programed/ Simulation

	MEDIA
(3) Train teachers to implement the curriculum	
Unit outlining how to design and conduct a workshop to train teachers of School X to teach the curriculum	Programed
(4) Obtain pretest data on current instruction in the area of the new curriculum at School X	
Unit presenting simulated data on an assessment of the instructional program that is to be replaced by the new curriculum	Simulated
(5) Make arrangements for introducing the new curriculum	
Unit presenting simulation of arrangements (schedules, teaching assignments, etc.) to implement the new curriculum at School X	Simulated
e. Launch instruction in the new curriculum	
Unit simulating introduction of the curriculum	Simulated
f. Monitor instruction, using feedback data to modify implementation	
Unit simulating method of gathering implementation data, process of data gathering, data obtained, and ways to make use of the data in modifying implementation	Simulated
g. Gather data and interpret, assessing outcomes of the curriculum	
Unit simulating summative assessment of the curriculum as implemented at School X	Simulated

A STRATEGY FOR TEACHING TASK 9, PREPARE INSTRUCTIONAL MATERIALS, IN THE WORK FLOW FOR DEVELOPMENT: CURRICULUM OR TRAINING PROGRAMS. (PREPARED BY LAUREN RESNICK)

What follows is an outline of a set of instructional components that would be useful in teaching trainees to prepare instructional materials. Many details need to be filled in before instruction could become operational. Places that need such elaboration are noted.

I. A first step is providing a specific definition of the terminal objectives. In particular, what is needed is a statement of the range of types of instructional materials our trainees should be able to prepare. This specification can be made in terms of (at least) the following dimensions:

A. Type of subject matter. We can specify standard and non-standard curriculum areas. We need, minimally, elementary school reading, math and science, and possibly social studies. Also, preschool skills (which will cut across traditional subject-matter boundaries), perceptual-motor skills, and some aspect of "creative" or "problem-solving" skills (these may fall into one of the other subject-matter areas). For the training program emphasis, we can distinguish: tutorial skills, small group instruction skills, classroom management skills, diagnostic skills, lesson preparation skills (at least).

B. Type of media used. These include: pencil and paper, film or video tape, audiotape, teacher presentation, peer tutoring, "manipulative" materials, teaching machines (including computer).

C. Type of instruction. "Prescriptive" (definite specifiable terminal behavior, directed use of materials, clear evaluation of responses, sequenced); "exploratory" (relatively unsequenced thus permitting greater choice to student, at least some use of materials is "open-ended"; there is not a specific right answer is every case, student gets to pose at least some of the questions).

D. Psychological classes of behaviors to be taught. At the grossest level, a distinction can be made between verbal "knowledge" repertoires (in which ability to talk about a subject-matter is involved) and "performance" repertoires (which may include some verbalization, but in which the criterion is ability to actually carry out some procedure). At a finer level, a variety of categories of behavior have been proposed (e.g., Mechner, Gagné). The following list seems to me to be useful: stimulus-discrimination tasks, labelling tasks, concept-attainment tasks, procedures (involving relatively extended chains of behavior; both "algorithmic" and "heuristic" procedures can be encompassed here and some further distinction may be needed), simple chains (e.g., reciting the alphabet).

E. Types of instructional strategies used. These should include: stimulus fading, use of diagrams and other visuals as cues, verbal prompting, simulation, modeling, spacing of practice, both recognition and constructed responses, both brief and extended constructed responses, backward chaining, different forms of feedback, role playing, etc.

A project director (PD) level person should have some exposure to instructional materials that adequately sample across all of these dimensions, and he should be able actually to prepare materials of several types in each dimension. A complete sampling may even be possible, since the five dimensions outlined are not completely uncorrelated, and a relatively limited set of problems might be adequate to expose him to all of the types of instructional problems outlined. The aim would be as wide an exposure as possible; limits on reaching this aim can only be established as we begin to actually select and try the problems to be worked on (see below).

A professional assistant (PA) level person might specialize somewhat more, particularly with respect to dimensions A, B and C. Probably, they should sample completely with respect to dimensions D and E.

A technical assistant (TA) level person could become quite highly specialized, although dimensions D and E would probably have to be pretty heavily sampled if we wanted to have any transfer from task to task on the job.

II. A four-component instructional program would be offered. It does not seem feasible to completely separate training on preparing instructional materials from consideration of instructional strategies (Step 8 in the work flow) and from subject-testing and revising instructional materials (Steps 10 and 11).

A. Seminar on the theory of instructional or lesson design. This seminar would be for PD level people, although some PA people who chose to specialize very heavily in designing and building programs might also participate. Approximately 15 class hours, plus reading and possibly paper-writing time. Focus would be on the technical literature relevant to instruction design. A reading list needs to be developed. Some suggestions for inclusion are: Mechner; Hively and Sidman on errorless learning with humans; Gagné, Staats, Resnick on programing complex intellectual skills and on programing social studies; Glaser on concept learning and many other topics; Moore on responsive environments; Margulies and Markle, et. al. on programing strategies; Gropper on use of visuals; Suchman and others on "discovery" or "inquiry" teaching; Skinner; Bruner.

B. Seminar on the analysis of instructional materials. This would be for both PD and PA level people. About 15 hours of class time plus preparation time are envisaged. This would involve looking intensively at a number of samples of instructional materials. The materials studied would be both "courses" (e.g., AAAS Science; McGraw-Hill Programed Reading; some of ESS's science lesson series; Nuffield mathematics) and individual lessons or units from larger courses. We would try to sample across all of the dimensions outlined in Section I. Analysis of instructional materials would be in terms of the following types of questions:

1. What is being taught. That is, without looking at the statement of objectives, but only at the materials and teachers' manuals themselves, state what kinds of performances students going through the materials could be expected to demonstrate.

2. Classification of what is taught--into one or more of the psychological categories listed in I-D.

3. Description of instructional strategies, both in general terms, and finding examples of each of the types of strategies listed in I-E.

4. Analysis of media use. What job is being done by the various media used (job includes: setting of tasks, giving instructions, presenting information, motivation and maintenance of attention, feedback to the student, feedback to the teacher or instructional designer, simulation, modeling, etc.)? Are the various media used to full advantage? Are they integrated with one another?

Setting up this segment of the training program would involve selecting the instructional materials to be analyzed and getting enough copies of them; and developing some kind of semi-structured materials review form that would guide students in their analysis.

This seminar would serve to expose students to a wide range of existing programs, and also give them an analytic tool which might be used in evaluating existing materials for possible use in educational programs. For this reason it might be of interest to some poeple specializing in design of learning environments or in implementation.

C. Laboratory in the editing of instructional materials. This is for all levels of trainees, including TA. It involves lab work ("exercises") followed by group discussions in which students compare their solutions to various problems and discuss them with the instructor. Some exercises might be done by groups of students rather than individually (on the architectural training model). There should be two phases, representing greater and lesser degrees of "guidance" in the editing of materials:

1. Trainee is given a statement of objectives (possibly terminal test items as well, where appropriate) together with the material to be edited. He is also given information from subject trials of the materials and/or of test data from subjects who used the materials. The trainee's job is to revise the materials (or outline desired revisions where expensive media do not permit actual revision). He must give the rationale for his revisions and defend these in group discussions.

2. Trainee is given statement of objectives and material to be edited, but no subject-test data. He must now revise on the basis of his assessment of how successful the materials are likely to be. As before, in discussion sessions, he will be asked to justify his revisions.

A possible addition to the discussion sessions is to have trainees actually conduct subject tests of their revised products and suggest further revisions based on results.

Many of the exercises for this component can be built around pieces of ongoing work in LRDC and other members of the consortium. It would take a couple of years of experience and revision before we put together a really efficient set of exercises, but the program could begin as early as September 1971, using whatever we can gather or specially prepare. We should try to sample widely along the dimensions in Section I, but there is room here for some trainee specialization, especially according to subject matter (dimension I-A) and perhaps dimensions I-B and I-C as well.

D. Laboratory in preparing materials. For all levels of trainees. Laboratory C is a prerequisite. Here trainees will be given objectives and perhaps criterion tests, and also (in the early stages for PD and PA people; throughout for the TA people) an outline of the instructional strategies to be used. The job is to prepare the materials. Typcially short-segments (the "lesson" level) would be used, leaving longer segments for the internship. There should be a sampling across the dimensions in Section I, especially dimensions I-D and I-E (the first three dimensions would permit some trainee specialization).

Where possible, we would use tasks actually under development at LRDC or elsewhere in the consortium.

There would be some "core" exercises for all trainees. The trainees would then meet to compare and discuss results with the instructor. Other exercises would be prepared only by students specializing in a particular area. The trainees would edit each other's work prior to group discussions with the instructor.

E. Internship. This could probably run concurrently with the above training components for PD and PA, but not come until after components C and D were completed (or nearly so) for TA.

ILLUSTRATIVE TRAINING MATERIALS

George L. Gropper
American Institutes for Research

Enclosed are illustrative materials taken from a program being developed for training personnel to develop their own curricula or their own training programs.

The illustrative materials appear in the opening section of a job aid which has been designed for use by trainees after they have completed the program. Supplemented by adjunct materials, the job aid will also be used during training. While learning to develop curricula, trainees will be given special guidance in using the job aid. Thus, the job aid will serve two key functions: (1) to facilitate trainee learning of the curriculum development process; and (2) to serve as a reference source once trainees are on the job developing their own curricula.

Key features of the job aid include:

(1) The use of an "identification matrix" to help the trainee discriminate between conditions in the development process which require differential treatment;

(2) The use of a "decision matrix" to help the trainee to associate the appropriate treatment with a relevant condition;

(3) The use of a "standards matrix" to help the trainee discriminate between different outcomes based on the treatment he has used or to discriminate between right and wrong outcomes; and

(4) The use of pre-prepared forms to guide the trainees' performance both during training and later on the job.

These key features have been designed to facilitate trainee acquisition during training of key skills in the development process and to facilitate trainee retention and transfer of these same skills on the job.

TASKS IN THE DEVELOPMENT PROCESS

A. COLLECT INFORMATION ABOUT TERMINAL BEHAVIOR

B. ANALYZE INFORMATION ABOUT TERMINAL BEHAVIOR

C. CREATE AND SEQUENCE LESSON UNITS FOR TEACHING TERMINAL BEHAVIOR

D. STATE OBJECTIVES FOR EACH LESSON UNIT

E. ASSESS SIMULATION NEEDS FOR EACH LESSON UNIT

F. DEVELOP TESTS FOR EACH LESSON UNIT

G. FORMULATE INSTRUCTIONAL STRATEGIES

H. DEVELOP INSTRUCTIONAL MATERIALS AND PROCEDURES

I. TRY OUT AND REVISE INSTRUCTIONAL MATERIALS AND PROCEDURES

J. FIELD TEST INSTRUCTIONAL MATERIALS AND PROCEDURES

A. COLLECT INFORMATION ABOUT TERMINAL BEHAVIOR

** A.1 Identify the type of terminal behavior to be taught and the type of target audience to which it will be taught

** A.2 Identify methods for obtaining information necessary to describe and analyze terminal behavior

A.3 Select information sources needed to describe and analyze terminal behavior

A.4 Plan the sequence in which information about terminal behavior will be collected

A.5 Develop (or plan to use existing) information-collecting instruments and procedures

A.6 Collect and record information

** Illustrative materials are presented for Tasks A.1 and A.2

STEP A.1

A.1 Identify the type of terminal behavior to be taught and the type of target audience to which it will be taught.

A.1.1 Identify the type(s) of terminal behavior to be taught.

A.1.2 Identify the type of target audience to be taught.

STEP A.1

OVERVIEW

INPUT	ACTION	OUTPUT
Plans for curriculum or training program development	Identify type of terminal behavior and type of target audience	Identification of types of terminal behavior and type of target audience

Sub-STEPS

			Identification
A.1.1	Development plans or comparable existing curriculum or training program i	Inspect for presence of characteristics indicating different types of terminal behavior ii	-KNOWLEDGE DOMAIN -PERFORMANCE -GENERAL COGNITIVE SKILLS -PERSONAL/SOCIAL BEHAVIOR iii
A.1.2	Development plans iv	Review for characteristics identifying the type of target audience v	-AGE/GRADE LEVEL -SOCIOECONOMIC STATUS -ETHNIC/RACIAL BACKGROUND -PHYSICAL/PSYCHOLOGICAL DEFICIT -PAST ACHIEVEMENT LEVEL vi

STEP A.1

PAGE INDEX

	CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
A.1.1	-MATRIX: Types of terminal behavior . . . . 17 -Examples 18			
A.1.2	-MATRIX: Types of target audience 21			

DESCRIPTION OF Sub-STEP	A.1.1

INPUT		ACTION		OUTPUT
Development plans or comparable existing curriculum or training program i	→	Inspect for presence of characteristics indicating different types of terminal behaviors ii	→	Identification of: -KNOWLEDGE DOMAIN -PERFORMANCE -GENERAL COGNITIVE SKILLS -PERSONAL/SOCIAL BEHAVIOR iii

Job Aid Contents

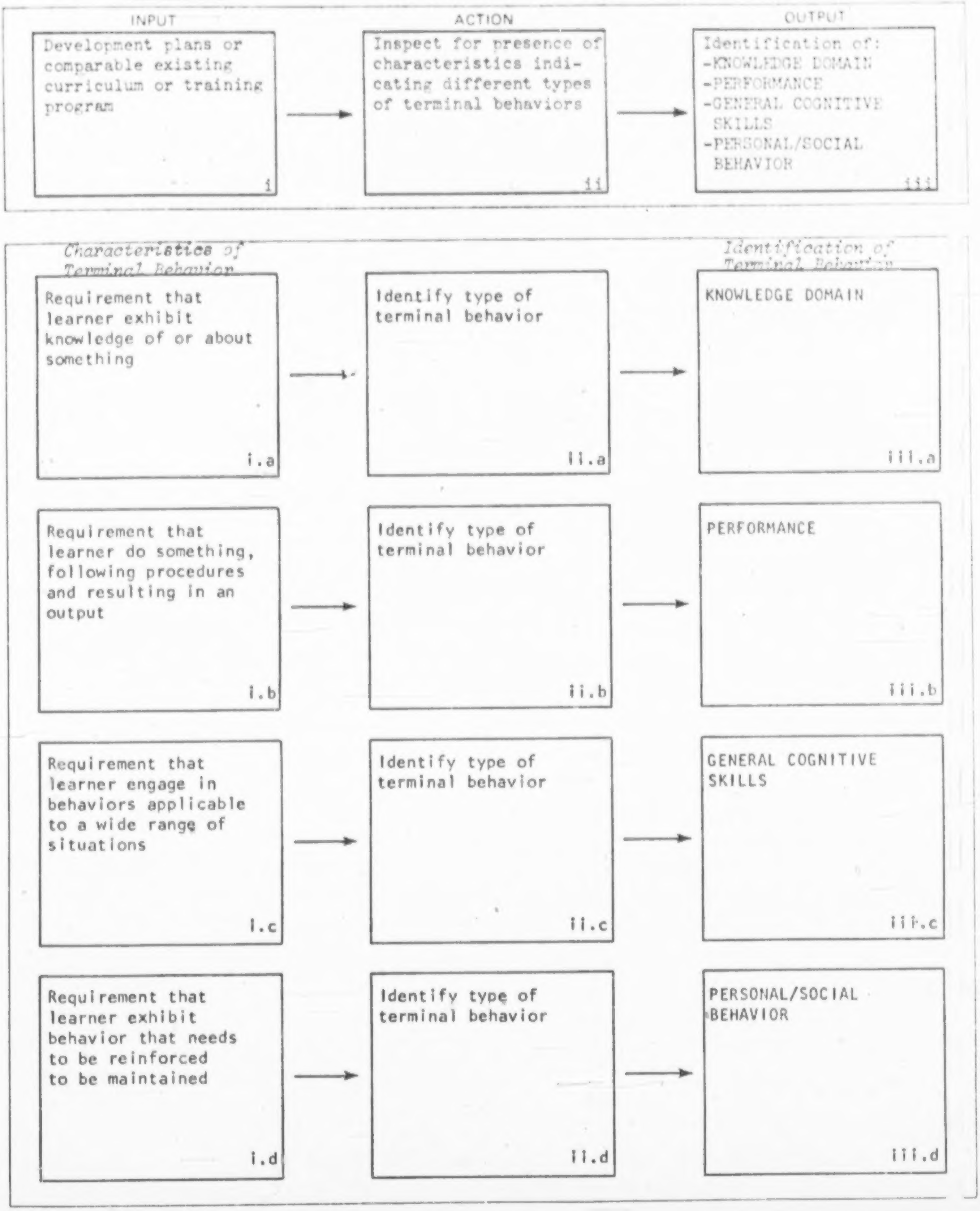
CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
-MATRIX: Types of terminal behavior . . . . 17 -Examples of terminal behavior 18			

Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS

Sub- STEP A.1.1

JOB DIAGRAM



INPUT	ACTION	OUTPUT
Development plans or comparable existing curriculum or training program i	Inspect for presence of characteristics indicating different types of terminal behaviors ii	Identification of: -KNOWLEDGE DOMAIN -PERFORMANCE -GENERAL COGNITIVE SKILLS -PERSONAL/SOCIAL BEHAVIOR iii

Characteristics of Terminal Behavior		*Identification of Terminal Behavior*
Requirement that learner exhibit knowledge of or about something i.a	Identify type of terminal behavior ii.a	KNOWLEDGE DOMAIN iii.a
Requirement that learner do something, following procedures and resulting in an output i.b	Identify type of terminal behavior ii.b	PERFORMANCE iii.b
Requirement that learner engage in behaviors applicable to a wide range of situations i.c	Identify type of terminal behavior ii.c	GENERAL COGNITIVE SKILLS iii.c
Requirement that learner exhibit behavior that needs to be reinforced to be maintained i.d	Identify type of terminal behavior ii.d	PERSONAL/SOCIAL BEHAVIOR iii.d

A.1.1

CRITERIA FOR IDENTIFYING FOUR TYPES OF TERMINAL BEHAVIOR

IDENTIFICATION MATRIX

CRITERIA	*Exhibits knowledge of or about something*	*Does something, following procedures and resulting in an attainment or production of an output*	*Exhibits an approach applicable to wide range of problems or situations*	*Engages in behavior that must be reinforced to be maintained (i.e., motivated)*
TYPES OF TERMINAL BEHAVIOR	KNOWLEDGE DOMAIN	PERFORMANCE	GENERAL COGNITIVE SKILLS	PERSONAL/SOCIAL BEHAVIOR
SUBJECT MATTER (SCHOOL) EXAMPLES	-Defines concepts -Gives or points to an example of a concept -States principles -Describes or labels objects or events -Cites facts*	-Performing experiments -Solving problems -Reading, writing -Translating a language -Constructing or using equipment -Writing an essay*	-Using discovery procedures -Applying a problem-solving model -Perceptual/motor skills -Creating new solutions to problems or procedures	-Persisting at work -Paying attention -Setting goals -Working independently -Showing interest in work -Not disturbing others -Cooperating with others
JOB EXAMPLES	-*All of above may occur plus:* -States rules about job performance -Lists procedures to follow on job -Gives a rationale for alternative procedures	-Performs procedural tasks -Makes or repairs products -Operates or trouble-shoots equipment -Performs decision-making tasks -Performs service tasks	-*Same as above*	-Keeping peers superiors or subordinates informed -Adhering to regulations -Getting work done on time -Cooperating with others

**Facts cited in an essay would be evidence of "knowledge" acquired. The structuring and organization of the essay would be evidence of "performance."*

A.1.1 EXAMPLES	KNOWLEDGE DOMAIN	PERFORMANCE
SUBJECT MATTER AREAS	-An English student stating rules of punctuation -A physics student identifying variables that need to be controlled in an experiment -A biology student classifying a frog -A math student describing properties of a quadratic equation -A history student listing the causes of the Civil War	-An English student punctuating a sentence -A physics student operationally controlling the variables in an experiment -A biology student dissecting a frog -A math student factoring a quadratic equation -A history student doing the research needed to identify the causes of the Civil War
JOBS	-A teacher describing a reinforcement schedule to maintain behavior -A librarian stating the rules for cataloguing books -A plant supervisor describing techniques for counseling subordinates	-A teacher implementing a reinforcement schedule that maintains behavior -A librarian actually cataloguing books -A plant supervisor actually counseling subordinates

DESCRIPTION OF Sub-STEP	A.1.2

INPUT	ACTION	OUTPUT
Development plans iv	Review for characteristics identifying the type of audience v	-AGE/GRADE LEVEL -SOCIOECONOMIC STATUS -ETHNIC/RACIAL BACKGROUND -PHYSICAL/PSYCHOLOGICAL DEFICIT -PAST ACHIEVEMENT LEVEL vi

Job Aid Contents

CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
-MATRIX: Types of target audience 21			

Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS

Sub- STEP A.1.2

JOB DIAGRAM

INPUT	ACTION	OUTPUT
Development plans iv	Review for characteristics identifying the type of target audience v	-AGE/GRADE LEVEL -SOCIOECONOMIC STATUS -ETHNIC/RACIAL BACKGROUND -PHYSICAL/PSYCHOLOGICAL DEFICIT -PAST ACHIEVEMENT LEVEL vi

Characteristics of Target Audiences		*Identification of Type of Target Audience*
-Age -Grade -Work status iv.a	Identify AGE or GRADE LEVEL v.a	-Preschoolers -Primary/secondary -High school -College -Adult vi.a
-Parental income -Residence patterns -Parental occupation iv.b	Identify SOCIOECONOMIC STATUS v.b	-Disadvantaged -Working class -Middle class -Urban/rural vi.b
-Color -Languages used -Religion iv.c	Identify ETHNIC/RACIAL BACKGROUND v.c	-Blacks -Spanish-speaking -Jews, Catholics vi.c
-Physical hanicaps -Emotional handicaps -Ability deviations iv.d	Identify PHYSICAL/PSYCHOLOGICAL DEVIATIONS v.d	-Blind -Deaf -Mentally retarded -Emotionally disturbed -Gifted vi.d
-School performance -School completion -Record of type of training received -Interest patterns -Test scores iv.e	Identify PAST EDUCATIONAL ACHIEVEMENT v.e	-Over/under achievers -Dropouts -School graduates -Grades received -Nature of training received vi.e

A.1.2 FIVE CHARACTERISTICS TO BE USED IN IDENTIFYING TYPE OF TARGET AUDIENCE

IDENTIFICATION MATRIX

CHARACTERISTICS	AGE OR GRADE LEVEL	SOCIOECONOMIC STATUS	ETHNIC/RACIAL BACKGROUND	PHYSICAL/ PSYCHOLOGICAL DEVIATIONS	PAST EDUCATIONAL ACHIEVEMENT
TYPES OF TARGET AUDIENCE	-Preschoolers -Primary/secondary students -High school students -College students -Adults	-Disadvantaged -Working class -Middle class and up -Urban -Rural	-Bilingual groups -Colored groups -Religious groups -Nationality groups -Minority groups	-Blind -Deaf -Mentally retarded -Gifted -Emotionally disturbed -Problems of malnutrition	-School graduates -Dropouts -Grades received -Type of training received -Over and under-achievers

STEP A.1

COMPLETION CHECKLIST

	IDENTIFIED	PERFORMED	PRODUCED	FORMS COMPLETED
A.1.1	-Types of terminal behavior to be taught			
A.1.2	-Types of target audience to be taught			

STEP A.2

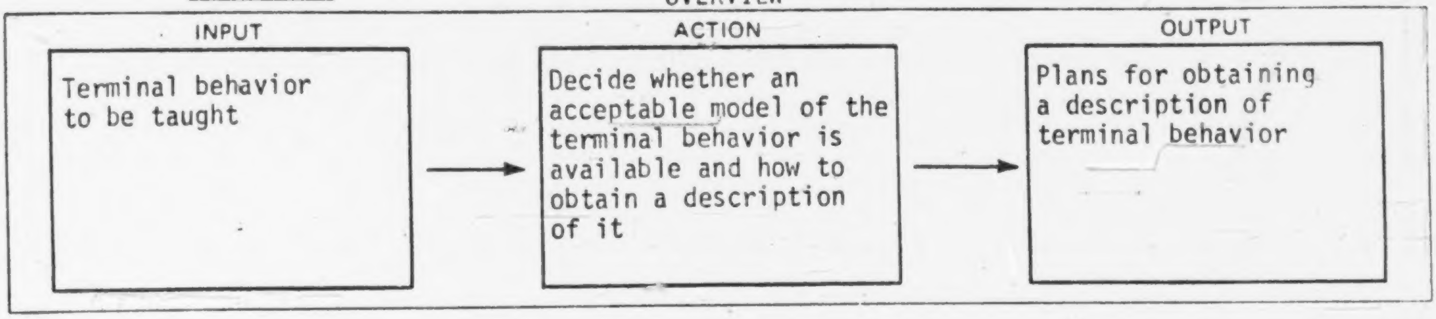
A.2 Identify methods for obtaining information necessary to describe and analyze terminal behavior.

A.2.1 Determine whether a model of terminal behavior is available and acceptable as a basis for curriculum or training program development.

A.2.2 Decide on methods for obtaining information needed to describe model of terminal behavior.

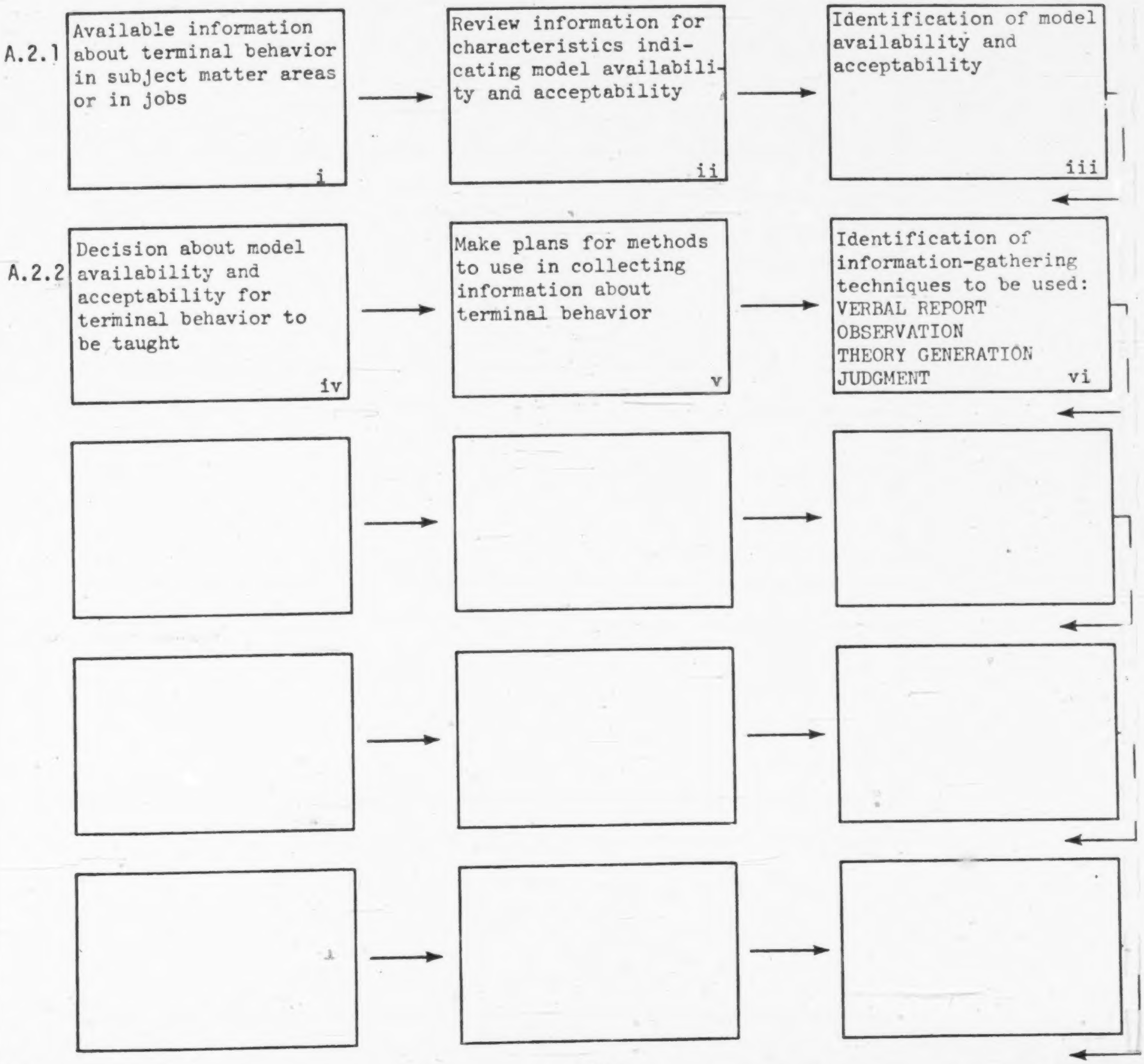
STEP A.2

OVERVIEW



INPUT	ACTION	OUTPUT
Terminal behavior to be taught	Decide whether an acceptable model of the terminal behavior is available and how to obtain a description of it	Plans for obtaining a description of terminal behavior

Sub-STEPS



A.2.1	Available information about terminal behavior in subject matter areas or in jobs i	Review information for characteristics indicating model availability and acceptability ii	Identification of model availability and acceptability iii
A.2.2	Decision about model availability and acceptability for terminal behavior to be taught iv	Make plans for methods to use in collecting information about terminal behavior v	Identification of information-gathering techniques to be used: VERBAL REPORT OBSERVATION THEORY GENERATION JUDGMENT vi

STEP A.2

PAGE INDEX

	CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
A.2.1	-MATRIX: Model availability . . 28 -MATRIX: Model acceptability . 29 -MATRIX: Model availability and acceptability . 30 31			
A.2.2		-MATRIX: Selecting description techniques . . . 34 36 - 37 -Examples 35		

DESCRIPTION OF Sub-STEP	A.2.1

INPUT	ACTION	OUTPUT
Available information about terminal behavior in subject matter areas or in jobs i	→ Review information for characteristics indicating model availability and acceptability ii	→ Identification of model availability and acceptability iii

Job Aid Contents

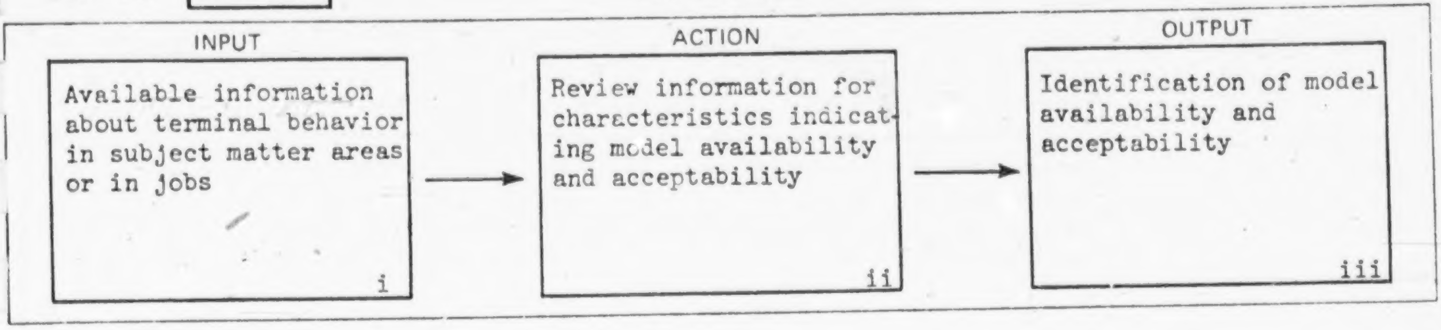
CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
MATRIX: Model availability . . 28 MATRIX: Model acceptability . 29 MATRIX: Model availability and 30 acceptability . 31			

Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS
Identification of type of terminal behavior	A.1.1			

Sub-STEP A.2.1

JOB DIAGRAM



INPUT

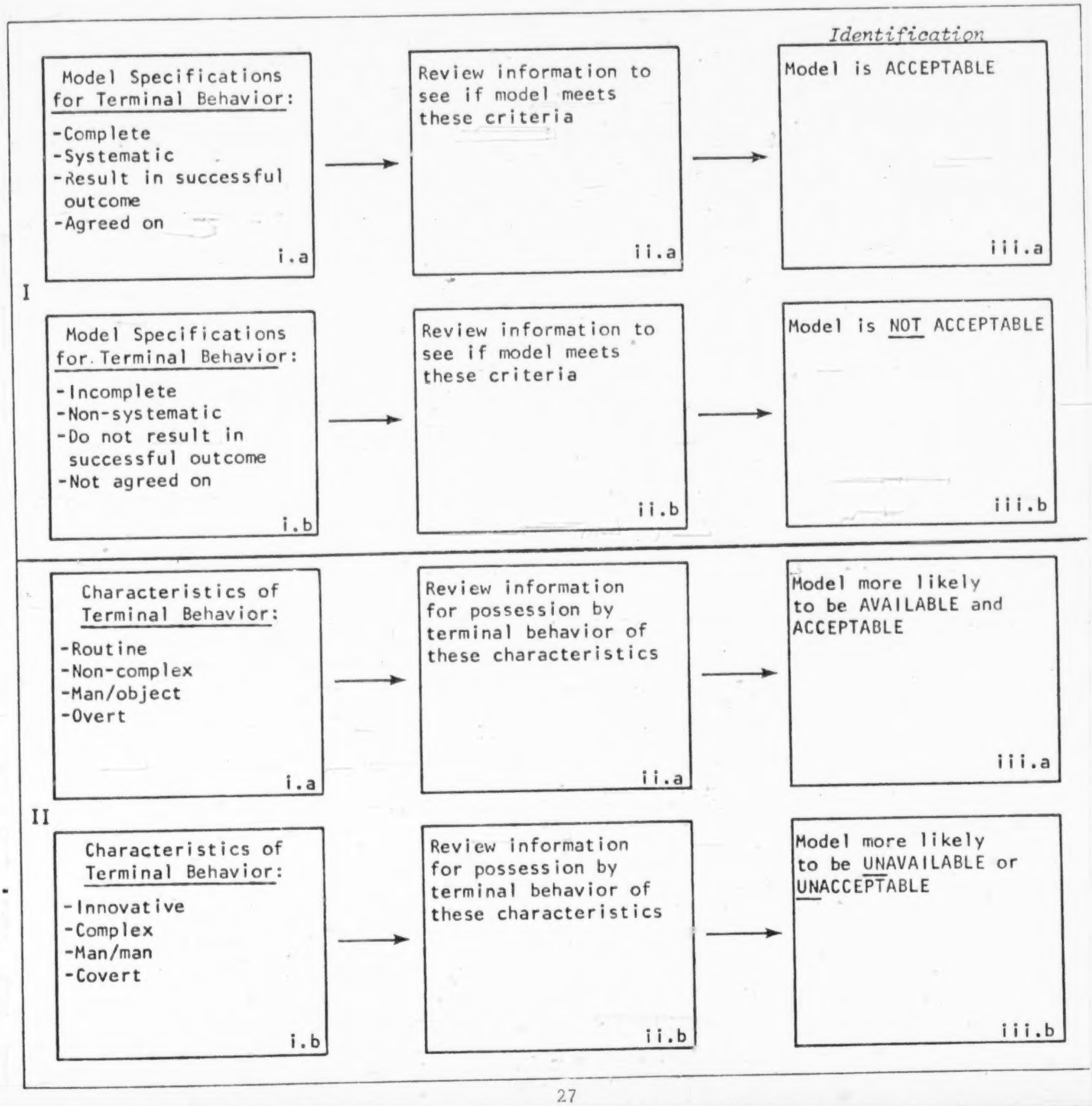
Available information about terminal behavior in subject matter areas or in jobs i

ACTION

Review information for characteristics indicating model availability and acceptability ii

OUTPUT

Identification of model availability and acceptability iii



I

Model Specifications for Terminal Behavior:
- Complete
- Systematic
- Result in successful outcome
- Agreed on

i.a

Review information to see if model meets these criteria ii.a

Identification

Model is ACCEPTABLE iii.a

Model Specifications for Terminal Behavior:
- Incomplete
- Non-systematic
- Do not result in successful outcome
- Not agreed on

i.b

Review information to see if model meets these criteria ii.b

Model is NOT ACCEPTABLE iii.b

II

Characteristics of Terminal Behavior:
- Routine
- Non-complex
- Man/object
- Overt

i.a

Review information for possession by terminal behavior of these characteristics ii.a

Model more likely to be AVAILABLE and ACCEPTABLE iii.a

Characteristics of Terminal Behavior:
- Innovative
- Complex
- Man/man
- Covert

i.b

Review information for possession by terminal behavior of these characteristics ii.b

Model more likely to be UNAVAILABLE or UNACCEPTABLE iii.b

A.2.1

CRITERIA FOR DETERMINING THE AVAILABILITY OF A MODEL OF TERMINAL BEHAVIOR

IDENTIFICATION MATRIX

CRITERIA	*-Terminal behavior is being exhibited* *-There are prescriptions for the terminal behavior*	*-Terminal behavior is not being exhibited* *-There are not prescriptions for the terminal behavior*
MODEL AVAILABILITY	MODEL IS AVAILABLE	MODEL IS NOT AVAILABLE
SUBJECT MATTER (SCHOOL) EXAMPLES	E.g., performing laboratory experiments E.g., writing book reports E.g., listing the advantages and disadvantages of a market economy	E.g., developing creative solutions to problems E.g., cooperating with fellow students on a group project
JOB EXAMPLES	E.g., the expert lathe operator exhibits all the required steps in using a lathe E.g., the expert accountant exhibits all the required steps in balancing figures in a ledger	E.g., new jobs not yet being performed

A.2.1

CRITERIA FOR DETERMINING THE ACCEPTABILITY OF A MODEL OF TERMINAL BEHAVIOR

IDENTIFICATION MATRIX

CRITERIA	*Model Specifications for Terminal Behavior:* *(1) are complete, comprehensive* *(2) are systematic* *(3) result in a successful outcome* *(4) are agreed on*	*Model Specifications for Terminal Behavior:* *(1) are not complete, comprehensive* *(2) are not systematic* *(3) do not result in a successful outcome* *(4) are not agreed on*
MODEL ACCEPTABILITY	MODEL IS ACCEPTABLE *when all four specifications are met*	MODEL IS NOT ACCEPTABLE *when any of the specifications are not met*
SUBJECT MATTER (SCHOOL) EXAMPLES	E.g., doing long division *The behaviors for doing long division are:* -Completely known -Fixed and systematic -Lead to a correct answer -Are agreed on by experts E.g., wiring lightbulbs and a battery in series -All four criteria are met	E.g., exhibiting evidence of "understanding" Ohm's Law *-There is agreement as to the content of Ohm's Law* *-There is not agreement as to how "understanding" should be expressed* *-Solving for an unknown* *-Writing the equation* *-Verbally describing the relations between the variables in the equation*
JOB EXAMPLES	E.g., switchboard operator handling incoming and outgoing calls *The behaviors are:* -Completely identified -Systematic -Lead to correct connections -Agreed to by experts E.g., teller processing deposit slips *The behaviors tend to be:* -Comprehensive -Systematic -Successful -Agreed to	E.g., teacher management of classroom (non-learning) behavior (as practiced by most teachers): *The models tend to be:* -Non-systematic -Unsuccessful E.g., sales behavior *The behaviors tend:* -Not uniformly to lead to success -Not to be agreed on -Not to be systematic

A.2.1

IDENTIFICATION MATRIX

CHARACTERISTICS OF TERMINAL BEHAVIOR DETERMINING THE LIKELIHOOD OF ITS MODEL BEING AVAILABLE AND ACCEPTABLE*

CHARACTERISTICS	*When terminal behavior is:* *-Routine, fixed set of procedures* *-Non-complex* *-Involves man/object relations* *-Overt*	*When terminal behavior is:* *-Innovative, variable procedures* *-Complex* *-Involves man/man relations* *-Covert*
MODEL AVAILABILITY AND ACCEPTABILITY	MODEL IS MORE LIKELY TO BE AVAILABLE AND ACCEPTABLE	MODEL IS LESS LIKELY TO BE AVAILABLE AND ACCEPTABLE
EXAMPLES	When terminal behavior is (one or more of the following): -Routine, involving fixed set of procedures e.g., doing long division e.g., typing -Non-complex e.g., punctuating a sentence e.g., mixing paint colors -Involves man/object relations e.g., using a lever e.g., operating equipment -Overt behavior e.g., writing	When terminal behavior is (one or more of the following): -Creative, innovative, involving alternative set of procedures e.g., painting an abstract e.g., formulating a theory -Complex e.g., practicing psychiatry e.g., writing an essay -Involves man/man relations e.g., managing classroom behavior e.g., cooperating in a group project -Covert behaviors e.g., reading

Mixtures of these characteristics are possible, sometimes resulting in available and acceptable models and sometimes not.

A.2.1

TYPES OF TERMINAL BEHAVIOR AND THE LIKELIHOOD OF THEIR HAVING AVAILABLE AND ACCEPTABLE MODELS

IDENTIFICATION MATRIX

TYPES OF TERMINAL BEHAVIOR	KNOWLEDGE DOMAIN	PERFORMANCE	GENERAL COGNITIVE SKILLS	PERSONAL/SOCIAL BEHAVIOR
MORE LIKELY to have available and acceptable model	✓ *For content to be learned:* E.g., which concepts, principles, facts, etc. should be learned	✓ E.g., dissecting a frog E.g., factoring a quadratic equation E.g., operating equipment		
LESS LIKELY to have available and acceptable model	✓ *For the form the evidence that learning has taken place* E.g., multiple choice vs. constructed answers E.g., defining a term vs. citing an example E.g., stating a rule vs. applying it		✓ E.g., taking a problem-solving approach to varied, new situations E.g., using a discovery method for learning	✓ E.g., cooperating with other students E.g., setting goals E.g., supervisory or managerial behavior

DESCRIPTION OF Sub-STEP	A.2.2

INPUT	ACTION	OUTPUT
Decision about model availability and acceptability for terminal behavior to be taught i	Make plans for methods to use in collecting information about terminal behavior ii	Identification of information-gathering techniques to be used: VERBAL REPORT OBSERVATION THEORY GENERATION JUDGMENT iii

Job Aid Contents

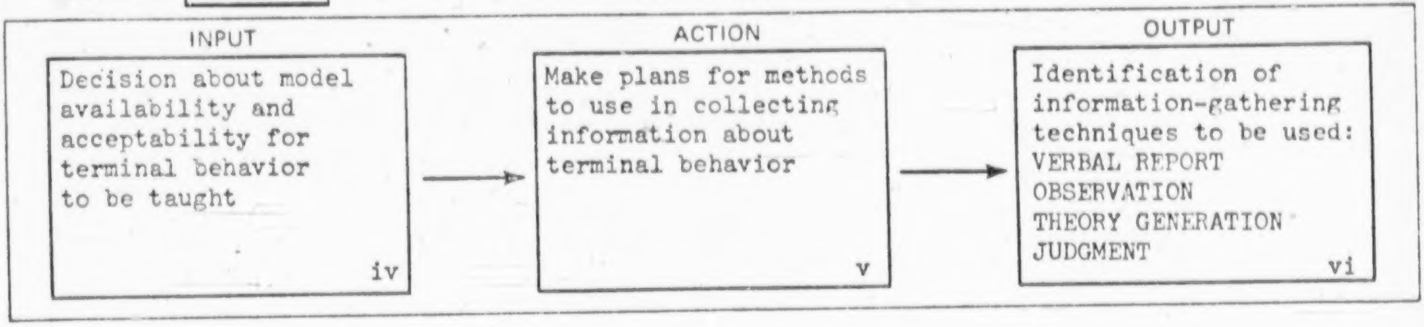
CRITERIA FOR IDENTIFYING INPUTS	ACTION TO BE TAKEN	STANDARD FOR OUTPUTS	FORMS TO USE
	MATRIX: Selecting description techniques . 34, 36 37 Examples 35		

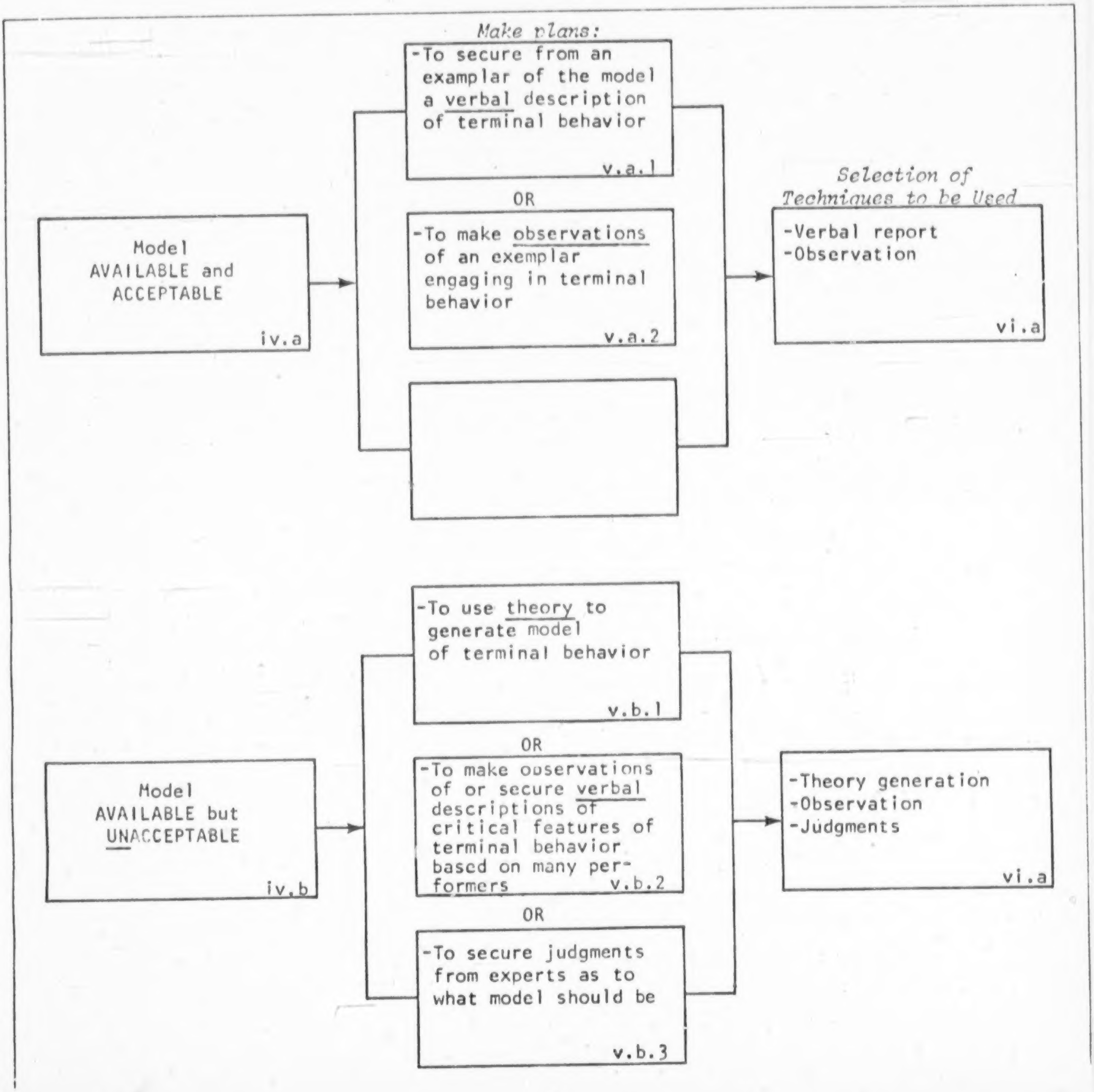
Required Materials

COMPLETED MATERIALS	STEP	COMPLETED FORMS	STEP	BLANK FORMS
Identification of model availability and acceptability	A.2.1			

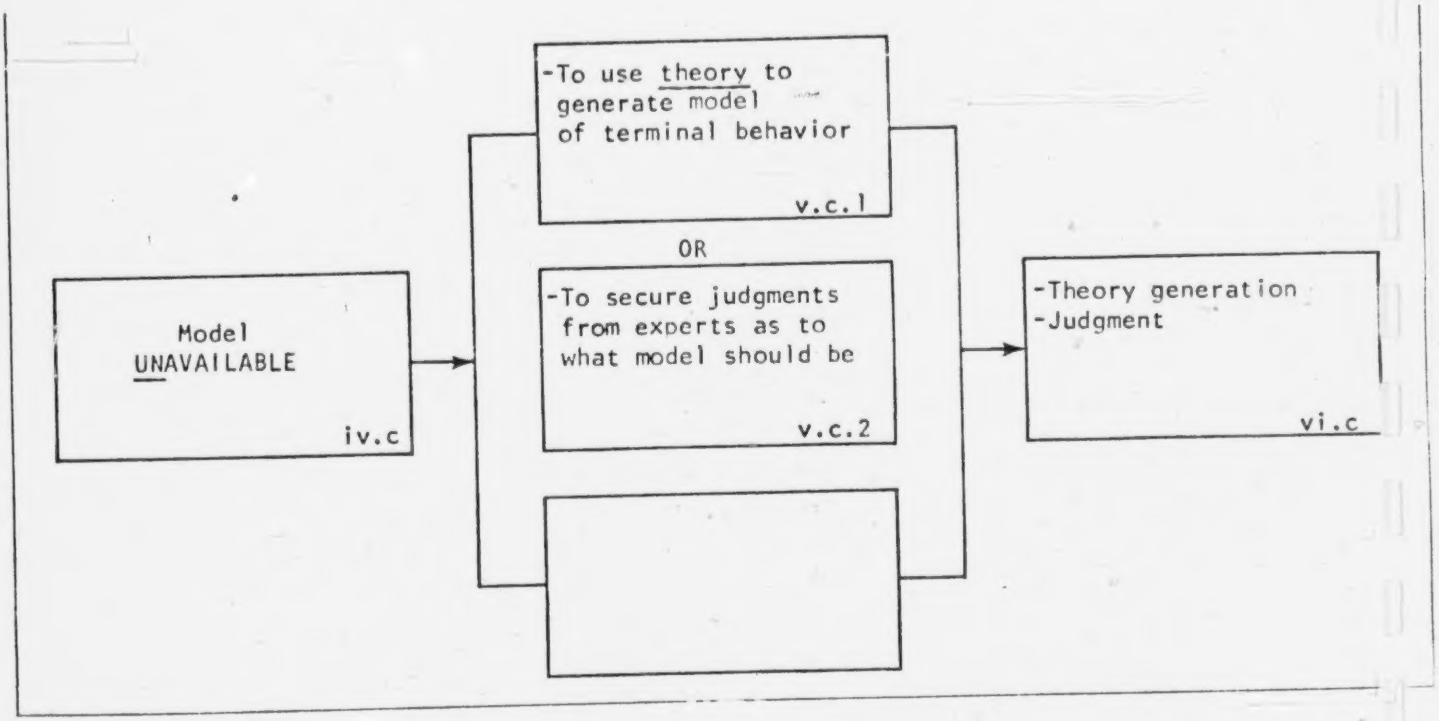
Sub-STEP A.2.2

JOB DIAGRAM


INPUT
Decision about model availability and acceptability for terminal behavior to be taught
iv
ACTION
Make plans for methods to use in collecting information about terminal behavior
v
OUTPUT
Identification of information-gathering techniques to be used:
VERBAL REPORT
OBSERVATION
THEORY GENERATION
JUDGMENT
vi


Make plans:
-To secure from an examplar of the model a verbal description of terminal behavior
v.a.1
OR
-To make observations of an exemplar engaging in terminal behavior
v.a.2
Model AVAILABLE and ACCEPTABLE
iv.a
Selection of Techniques to be Used
-Verbal report
-Observation
vi.a
-To use theory to generate model of terminal behavior
v.b.1
OR
-To make observations of or secure verbal descriptions of critical features of terminal behavior based on many performers
v.b.2
OR
-To secure judgments from experts as to what model should be
v.b.3
Model AVAILABLE but UNACCEPTABLE
iv.b
-Theory generation
-Observation
-Judgments
vi.a

Sub-STEP A.2.2. (cont.)


Model
UNAVAILABLE
iv.c
-To use theory to generate model of terminal behavior
v.c.1
OR
-To secure judgments from experts as to what model should be
v.c.2
-Theory generation
-Judgment
vi.c

CHOICE OF INFORMATION-GATHERING TECHNIQUES BASED ON MODEL AVAILABILITY AND ACCEPTABILITY

DECISION MATRIX

CONDITIONS	*Model AVAILABLE and ACCEPTABLE* *-Comprehensive* *-Systematic* *-Successful* *-Agreed to*	*Model AVAILABLE but UNACCEPTABLE* *-Incomplete, or* *-Nonsystematic, or* *-Unsuccessful, or* *-Not agreed to*	*Model UNAVAILABLE*
ACTION TO TAKE	OBTAIN DESCRIPTION OF MODEL	FORMULATE AND DESCRIBE MODEL	FORMULATE AND DESCRIBE MODEL
SOURCE OF MODEL DESCRIPTION	(1) The total performance of an expert is described	(1) Critical elements in the performance of many people are described resulting in a total description of a model (2) Theory is used to generate a description of a model* (3) Judgments of experts are used to create a model	(1) Theory is used to generate a description of a model* (2) Judgments of experts are used to create a model
SPECIFIC TECHNIQUES TO USE	(1a) Have the expert verbally describe his own total performance (1b) Have an independent observer observe and verbally describe the total performance	(1) Have the performer, his subordinate, or his superior report on critical features of just part of the total performance (a) From memory (b) From immediate observation (2) Use appropriate theory to generate behaviors to be used (3) Use judgments to obtain agreement to what the model should be	(1) Use appropriate theory to generate behaviors to be used (2) Use judgments to obtain agreement to what the model should be

**Theory is preferred to judgments whenever there is an appropriate one available.*

A.2.2

EXAMPLES

ACTION TO TAKE	*-Using the behavior of an expert as the model* *-Have him verbally describe his own behavior* *-Observe and describe his behavior*	*-Use theory to generate a model* *-Use expert judgment to create a model* *-Describe critical elements in performance of many performers*	*-Generate from theory a statement of terminal behavior* *-Secure judgments from experts as to what terminal behavior should be*
CONDITIONS	Model AVAILABLE and ACCEPTABLE	Model AVAILABLE but UNACCEPTABLE	Model UNAVAILABLE
SUBJECT MATTER (SCHOOL) EXAMPLES	E.g., have a mathematician describe his operations in solving for an unknown in an equation E.g., Have a chemist demonstrate how he performs an experiment	-Secure judgments from experts as to content of terminal behavior; and from education specialists what form behavior should take: E.g., geography: how the student should identify relationships between raw materials' availability and growth of urban centers E.g., music: how the student should identify musical styles	E.g., secure judgments from education specialists as to the behaviors involved in the "discovery" process E.g., secure judgments from development specialists as to behaviors involved in "cooperation"
JOB EXAMPLES	E.g., have an expert woodworker describe all the steps he follows in preparing lumber for use E.g., have an expert secretary demonstrate how she files correspondence	-Have many job holders or their supervisors describe single behaviors that proved critical in some portion of the task of: E.g., troubleshooting malfunctions in electronic equipment E.g., planning manpower strategies	E.g., generate from behavior theory a statement of teacher behaviors to be used in managing classroom problem behavior -Use reinforcement to strengthen adaptive behavior -Use extinction to weaken non-adaptive behavior

A.2.2

MORE SPECIFIC GUIDELINES WHEN A MODEL IS AVAILABLE BUT UNACCEPTABLE

DECISION
MATRIX

CONDITIONS	Model is *INCOMPLETE or NOT SYSTEMATIC*	Model results in *UNSUCCESSFUL OUTCOMES*	Model is *NOT AGREED TO*
Model is *COMPLETE and SYSTEMATIC*		Use theory to develop model E.g., teacher lecturing behavior may be completely described, but the model does not lead to success; use instructional technology model to generate model of lecturing behavior	Use judgment of experts to develop model E.g., biologists agree on content, but not on form of terminal behavior: Secure judgments of education specialists on form terminal behavior should take
Model results in *SUCCESSFUL OUTCOME*	Develop model by describing critical elements in performance of many performers E.g., troubleshooting electronics equipment: Performers of this job succeed, but the description of their performance is incomplete; the description of their collective experience leads to a complete model		Develop model by describing critical elements in performance of many performers Use judgment of experts to develop model
Model is *AGREED TO*	Develop model by describing critical elements in performance of many performers E.g., the major procedures in the development of curricula are agreed to; the model is incomplete, however: Secure from many technologists descriptions of critical elements in their performance	Use theory to develop model E.g., counselling procedures may be agreed on, but they are unsuccessful; use theory to generate effective model	

A.2.2

INFORMATION-GATHERING TECHNIQUES LIKELY TO BE USED FOR DIFFERENT TYPES OF TERMINAL BEHAVIOR

DECISION
MATRIX

TYPE OF TERMINAL BEHAVIORS	*KNOWLEDGE DOMAIN*	*PERFORMANCE*	*GENERAL COGNITIVE SKILLS*	*PERSONAL/SOCIAL BEHAVIOR*
SUBJECT MATTER (SCHOOL)	-Judgments about: -Subject matter content -Form of terminal behavior	-Observation -Verbal report of a single performer -Theory generation of model	-Theory generation of a model -Judgments about what model should be	-Theory generation of a model -Judgments about what model should be -Descriptions of critical elements in many performances
JOBS	-Judgments about: -Subject matter content -Form of terminal behavior	-Observation -Verbal report of a single performer -Descriptions of critical elements in many performances -Theory generation of model	-Theory generation of a model -Judgments about what model should be	-Theory generation of a model -Judgments about what model should be -Descriptions of critical elements in many performances

STEP A.2

COMPLETION CHECKLIST

	IDENTIFIED	PERFORMED	PRODUCED	FORMS COMPLETED
A.2.1	-Availability and acceptability of model of terminal behavior			
A.2.2		-Selection of methods for obtaining a description of terminal behavior		